SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies steel studs wall systems, shaft wall systems, ceiling or soffit suspended or furred framing, wall furring, fasteners, and accessories for the screw attachment of gypsum board and other building materials, indicated on Drawings.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS for additional LEED requirements.
B. Section 01 81 19, INDOOR AIR QUALITY REQUIREMENTS for VOC limit
C. Load bearing framing: Section 05 40 00, COLD-FORMED METAL FRAMING.
D. Support for wall mounted items: Section 05 50 00, METAL FABRICATIONS.
E. Pull down tabs in steel decking: Section 05 36 00, COMPOSITE METAL DECKING.
F. Ceiling suspension systems for acoustical tile or panels and lay in gypsum board panels: Section 09 51 00, ACOUSTICAL CEILINGS, Section 09 29 00, GYPSUM BOARD.

1.3 TERMINOLOGY

A. Description of terms shall be in accordance with ASTM C754, ASTM C11, ASTM C841 and as specified.
B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by beams, trusses, or bar joists. In interstitial spaces with walk-on floors the underside of the walk-on floor is the underside of structure overhead.
C. Thickness of steel specified is the minimum bare (uncoated) steel thickness.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Manufacturer's Literature and Data:
   1. Studs, runners and accessories.
   2. Hanger inserts.
   3. Channels (Rolled steel).
   4. Furring channels.
   5. Screws, clips and other fasteners.
C. Shop Drawings:
   1. Typical ceiling suspension system.

2. Typical metal stud and furring construction system including details around openings and corner details.
3. Typical shaft wall assembly
4. Typical fire rated assembly and column fireproofing showing details of construction same as that used in fire rating test.

D. Test Results: Fire rating test designation, each fire rating required for each assembly.

E. LEED Submittals:

1. Credits MR 4.1 & 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.
   a. Include statement indicating costs for each product containing recycled content.
2. Credits MR 5.1 & 5.2: For products manufactured within 500 miles of project site *and* whose raw materials are extracted, harvested or recovered, within 500 miles of the project site, documentation indicating the location and distance of material manufacturer and point of extraction, harvest, or recovery for each raw material from the Project site.
   a. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

A. In accordance with the requirements of ASTM C754.

1.6 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American Society For Testing And Materials (ASTM)

A123-09.....Zinc (Hot-dip Galvanized) Coatings on Iron and Steel Products

A653/A653M-09.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process

A641-09.....Zinc-Coated (Galvanized) Carbon Steel Wire

C11-09.....Terminology Relating to Gypsum and Related Building Materials and Systems

C635-07.....Manufacture, Performance, and Testing of Metal Suspension System for Acoustical Tile and Lay-in Panel Ceilings

C636-08.....Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels

C645-08.....Non-Structural Steel Framing Members
C754-08.....Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
C841-03 (12 2008).....Installation of Interior Lathing and Furring
C954-07.....Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
C1002-07.....Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
E580-08.....Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Moderate Seismic Restraint.

PART 2 - PRODUCTS

2.1 LEED REQUIREMENTS

A. Recycled Content of Steel Products: Provide steel products with minimum 25% post-consumer recycled content.

2.2 PROTECTIVE COATING

A. Galvanize steel studs, runners (track), rigid (hat section) furring channels, "Z" shaped furring channels, and resilient furring channels, with coating designation of G-60 minimum, per ASTM 123.

2.3 STEEL STUDS AND RUNNERS (TRACK)

A. ASTM C645, modified for thickness specified and sizes and shown.
   1. Use ASTM A525 steel, 0.84 mm (0.033-inch) thick bare metal.
   2. Runners same thickness as studs.
B. Provide not less than two cutouts in web of each stud, approximately 300 mm (12 inches) from each end, and intermediate cutouts on approximately 600 mm (24-inch) centers.
C. Doubled studs for openings and studs for supporting concrete backer-board.
D. Studs 3600 mm (12 feet) or less in length shall be in one piece.
E. Shaft Wall Framing:
   1. Conform to rated wall construction.
   2. C-H Studs.
   3. E Studs.
   4. J Runners.
   5. Steel Jamb-Strut.

2.4 FURRING CHANNELS

A. Rigid furring channels (hat shape): ASTM C645.

B. Resilient furring channels:
   1. Not less than 0.45 mm (0.0179-inch) thick bare metal.
   2. Semi-hat shape, only one flange for anchorage with channel web leg slotted on anchorage side, channel web leg on other side stiffens fastener surface but shall not contact anchorage surface other channel leg is attached to.

C. "Z" Furring Channels:
   1. Not less than 0.45 mm (0.0179-inch)-thick bare metal, with 32 mm (1-1/4 inch) and 19 mm (3/4-inch) flanges.
   2. Web furring depth to suit thickness of insulation with slotted perforations.

D. Rolled Steel Channels: Not less than 1.34 mm (0.053-inch)-thick bare metal, ASTM C754, cold rolled; or, ASTM C841, cold rolled.

2.5 FASTENERS, CLIPS, AND OTHER METAL ACCESSORIES

A. ASTM C754, except as otherwise specified.

B. For fire rated construction: Type and size same as used in fire rating test.

C. Fasteners for steel studs thicker than 0.84 mm (0.033-inch) thick. Use ASTM C954 steel drill screws of size and type recommended by the manufacturer of the material being fastened.

D. Clips: ASTM C841 (paragraph 6.11), manufacturer’s standard items. Clips used in lieu of tie wire shall have holding power equivalent to that provided by the tie wire for the specific application.

E. Concrete ceiling hanger inserts (anchorage for hanger wire and hanger straps): Steel, zinc-coated (galvanized), manufacturers standard items, designed to support twice the hanger loads imposed and the type of hanger used.

F. Tie Wire and Hanger Wire:
   1. ASTM A641, soft temper, Class 1 coating.
   2. Gage (diameter) as specified in ASTM C754 or ASTM C841.

G. Attachments for Wall Furring:
   1. Manufacturers standard items fabricated from zinc-coated (galvanized) steel sheet.
   2. For concrete or masonry walls: Metal slots with adjustable inserts or adjustable wall furring brackets. Spacers may be fabricated from 1 mm (0.0396-inch) thick galvanized steel with corrugated edges.

H. Power Actuated Fasteners: Type and size as recommended by the manufacturer of the material being fastened.

2.6 SUSPENDED CEILING SYSTEM FOR GYPSUM BOARD

A. Conform to ASTM C635, heavy duty, with not less than 35 mm (1-3/8 inch) wide knurled capped flange face designed for screw attachment of gypsum board.

B. Wall track channel with 35 mm (1-3/8 inch) wide flange.

PART 3 - EXECUTION

3.1 INSTALLATION CRITERIA

A. Where fire rated construction is required for walls, partitions, columns, beams and floor-ceiling assemblies, the construction shall be same as that used in fire rating test.

B. Construction requirements for fire rated assemblies and materials shall be as shown and specified, the provisions of the Scope paragraph (1.2) of ASTM C754 and ASTM C841 regarding details of construction shall not apply.

3.2 INSTALLING STUDS

A. Install studs in accordance with ASTM C754, except as otherwise shown or specified.

B. Space studs not more than 400 mm (16 inches) on center.

C. Cut studs 6 mm to 9 mm (1/4 to 3/8-inch) less than floor to underside of structure overhead when extended to underside of structure overhead.

D. Where studs are shown to terminate above suspended ceilings, provide bracing as shown or extend studs to underside of structure overhead.

E. Extend studs to underside of structure overhead for fire, rated partitions, smoke partitions, shafts, and sound rated partitions and insulated exterior wall furring.

F. Openings:

1. Frame jambs of openings in stud partitions and furring with two studs placed back to back or as shown.
2. Fasten back to back studs together with 9 mm (3/8-inch) long Type S pan head screws at not less than 600 mm (two feet) on center, staggered along webs.
3. Studs fastened flange to flange shall have splice plates on both sides approximately 50 X 75 mm (2 by 3 inches) screwed to each stud with two screws in each stud. Locate splice plates at 600 mm (24 inches) on center between runner tracks.

G. Fastening Studs:

1. Fasten studs located adjacent to partition intersections, corners and studs at jambs of openings to flange of runner tracks with two screws through each end of each stud and flange of runner.

2. Do not fasten studs to top runner track when studs extend to underside of structure overhead.

H. Chase Wall Partitions:

1. Locate cross braces for chase wall partitions to permit the installation of pipes, conduits, carriers and similar items.
2. Use studs or runners as cross bracing not less than 63 mm (2-1/2 inches wide).

I. Form building seismic or expansion joints with double studs back to back spaced 75 mm (three inches) apart plus the width of the seismic or expansion joint.

J. Form control joint, with double studs spaced 13 mm (1/2-inch) apart.

3.3 INSTALLING WALL FURRING FOR FINISH APPLIED TO ONE SIDE ONLY

A. In accordance with ASTM C754, or ASTM C841 except as otherwise specified or shown.

B. Wall furring-Stud System:

1. Framed with 63 mm (2-1/2 inch) or narrower studs, 600 mm (24 inches) on center.
2. Brace as specified in ASTM C754 for Wall Furring-Stud System or brace with sections or runners or studs placed horizontally at not less than three foot vertical intervals on side without finish.
3. Securely fasten braces to each stud with two Type S pan head screws at each bearing.

C. Direct attachment to masonry or concrete; rigid channels or "Z" channels:

1. Install rigid (hat section) furring channels at 600 mm (24 inches) on center, horizontally or vertically.
2. Install "Z" furring channels vertically spaced not more than 600 mm (24 inches) on center.
3. At corners where rigid furring channels are positioned horizontally, provide mitered joints in furring channels.
4. Ends of spliced furring channels shall be nested not less than 200 mm (8 inches).
5. Fasten furring channels to walls with power-actuated drive pins or hardened steel concrete nails. Where channels are spliced, provide two fasteners in each flange.
6. Locate furring channels at interior and exterior corners in accordance with wall finish material manufacturers printed erection instructions. Locate "Z" channels within 100 mm (4 inches) of corner.

D. Installing Wall Furring-Bracket System: Space furring channels not more than 400 mm (16 inches) on center.

3.4 INSTALLING SUPPORTS REQUIRED BY OTHER TRADES

A. Provide for attachment and support of electrical outlets, plumbing, laboratory or heating fixtures, recessed type plumbing fixture accessories, access panel frames, wall bumpers, wood seats, toilet stall partitions, dressing booth partitions, urinal screens, chalkboards, tackboards, wall-hung casework, handrail brackets, recessed fire extinguisher cabinets and other items like auto door buttons and auto door operators supported by stud construction.

B. Provide additional studs where required. Install metal backing plates, or special metal shapes as required, securely fastened to metal studs.

3.5 INSTALLING SHAFT WALL SYSTEM

A. Conform to UL Design Nos. indicated on Drawings for two-hour fire rating.

B. Position J runners at floor and ceiling with the short leg toward finish side of wall. Securely attach runners to structural supports with power driven fasteners at both ends and 600 mm (24 inches) on center.

C. After liner panels have been erected, cut C-H studs and E studs, from 9 mm (3/8-inch) to not more than 13 mm (1/2-inch) less than floor-to-ceiling height. Install C-H studs between liner panels with liner panels inserted in the groove.

D. Install full-length steel E studs over shaft wall line at intersections, corners, hinged door jambs, columns, and both sides of closure panels.

E. Suitably frame all openings to maintain structural support for wall:
   1. Provide necessary liner fillers and shims to conform to label frame requirements.
   2. Frame openings cut within a liner panel with E studs around perimeter.
   3. Frame openings with vertical E studs at jambs, horizontal J runner at head and sill.

F. Elevator Shafts:
   1. Frame elevator door frames with 0.87 mm (0.0341-inch) thick J strut or J stud jambs having 75 mm (three-inch) long legs on the shaft side.
   2. Protrusions including fasteners other than flange of shaft wall framing system or offsets from vertical alignments more than 3 mm (1/8-inch) are not permitted unless shown.
   3. Align shaft walls for plumb vertical flush alignment from top to bottom of shaft.

3.6 INSTALLING FURRED AND SUSPENDED CEILINGS OR SOFFITS

A. Install furred and suspended ceilings or soffits in accordance with ASTM C754 or ASTM C841 except as otherwise specified or shown for screw attached gypsum board ceilings and for plaster ceilings or soffits.
   1. Space framing at 400 mm (16-inch) centers for metal lath anchorage.
   2. Space framing at 600 mm (24-inch) centers for gypsum board anchorage.

B. New exposed concrete slabs:
   1. Use metal inserts required for attachment and support of hangers or hanger wires with tied wire loops for embedding in concrete.
   2. Furnish for installation under Division 3, CONCRETE.
   3. Suspended ceilings under concrete rib construction shall have runner channels at right angles to ribs and be supported from ribs with hangers at ends and at 1200 mm (48-inch) maximum intervals along channels. Stagger hangers at alternate channels.

C. Concrete slabs on steel decking composite construction:
   1. Use pull down tabs when available.
   2. Use power activated fasteners when direct attachment to structural framing can not be accomplished.

D. Where bar joists or beams are more than 1200 mm (48 inches) apart, provide intermediate hangers so that spacing between supports does not exceed 1200 mm (48 inches). Use clips, bolts, or wire ties for direct attachment to steel framing.

E. Steel decking without concrete topping:
   1. Do not fasten to steel decking 0.76 mm (0.0299-inch) or thinner.
   2. Toggle bolt to decking 0.9 mm (0.0359-inch) or thicker only where anchorage to steel framing is not possible.

F. Installing suspended ceiling system for gypsum board:
   1. Install only for ceilings to receive screw attached gypsum board.
   2. Install in accordance with ASTM C636.
      a. Install main runners spaced 1200 mm (48 inches) on center.
      b. Install 1200 mm (four foot) tees not over 600 mm (24 inches) on center; locate for edge support of gypsum board.
      c. Install wall track channel at perimeter.

G. Installing Ceiling Bracing System:
   1. Construct bracing of 38 mm (1-1/2 inch) channels for lengths up to 2400 mm (8 feet) and 50 mm (2 inch) channels for lengths over 2400 mm (8 feet) with ends bent to form surfaces for anchorage to carrying channels and over head construction. Lap channels not less than 600 mm (2 feet) at midpoint back to back. Screw or bolt lap together with two fasteners.

2. Install bracing at an approximate 45 degree angle to carrying channels and structure overhead; secure as specified to structure overhead with two fasteners and to carrying channels with two fasteners or wire ties.
3. Brace suspended ceiling or soffit framing in accordance with ASTM E580.

3.7 TOLERANCES

A. Fastening surface for application of subsequent materials shall not vary more than 3 mm (1/8-inch) from the layout line.
B. Plumb and align vertical members within 3 mm (1/8-inch.)
C. Level or align ceilings within 3 mm (1/8-inch.)

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SECTION 09 24 00
PORTLAND CEMENT PLASTERING

PART 1 GENERAL

1.1 DESCRIPTION

A. This section specifies lathing and Portland cement based plaster.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS for additional LEED requirements.

B. Section 01 81 19, INDOOR AIR QUALITY REQUIREMENTS for VOC limit.

C. Steel framing members for attachment of plaster bases: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.

D. Room finish schedule and color: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 TERMINOLOGY

A. Definitions and description of terms shall be in accordance with ASTM C11, C841, and C926 and as specified.

B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by beams, trusses, and bar joists.

C. Self-furring Lath: Metal plastering bases having dimples or crimps designed to hold the plane of the back of the lath 6 to 10 mm (1/4 to 3/8 inch) away from the plane of the solid backing.

D. Wet Areas: Areas of a building where cyclic or continuous exposure to very humid or wet conditions, or in which a dew point condition may occur in the plaster. Dew point conditions occur frequently in such areas as laundries, natatoriums, cart and dish washing spaces, hydrotherapy, kitchens, bathing or shower rooms and similar areas.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Accessories for plaster, each type.
2. Metal plastering bases, each type.
3. Fasteners.
4. Bonding compounds, including application instructions.
5. Admixtures, including mixing and application instructions.

C. Samples:

Accessories for plaster, each type, not less than 150 mm (6 inches) long.

Panel showing finish coat 150 by 300 mm (6 by 12 inches).

D. LEED Submittals:
   1. Credits MR 4.1 & 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.
      a. Include statement indicating costs for each product containing recycled content.
   2. Credits MR 5.1 & 5.2: For products manufactured within 500 miles of project site *and* whose raw materials are extracted, harvested or recovered, within 500 miles of the project site, documentation indicating the location and distance of material manufacturer and point of extraction, harvest, or recovery for each raw material from the Project site.
      a. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

1.5 PROJECT CONDITIONS

A. Maintain work areas for interior work at a temperature of not less than 4°C (40°F) for not less than 48 hours prior to application of plaster, during application of plaster and until plaster is completely dry.
B. Exterior plaster shall not be applied when the ambient temperature is less than 4°C (40°F).
C. Plaster shall not be applied to frozen surfaces or surfaces containing frost.
D. Frozen materials shall not be used in the mix.
E. Plaster coats shall be protected against freezing for a period of not less than 24 hours after application.

1.6 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.
B. American Society for Testing And Materials (ASTM):

A653/A653M-07.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
A641-03.....Zinc-Coated (Galvanized) Carbon Steel Wire
C11-07.....Terminology Relating to Gypsum and Related Building Materials and Systems.
C91-05.....Masonry Cement
C150-07.....Portland Cement
C206-03.....Finishing Hydrated Lime
C207-06.....Hydrated Lime for Masonry Purposes

C260-06.....Air Entraining Admixtures for Concrete.
C841-03.....Installation of Interior Lathing and Furring
C847-06.....Metal Lath
C897-05.....Aggregate for Job-Mixed Portland Cement Based Plasters
C926-06.....Application of Portland Cement-Based Plaster
C1002-07.....Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs

C. Commercial Item Description (CID):
A-A-55615.....Shield, Expansion (Wood Screw and Lag Bolt Self-Threading Anchors)

D. Federal Specifications (Fed Spec.):
UU-B-790A.....Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellent and Fire Resistant)

PART 2 - PRODUCTS

2.1 METAL PLASTERING BASES

A. LEED Requirements:
1. Recycled Content of Steel Products: Provide steel products with minimum 25% post-consumer recycled content.

B. Expanded Metal Lath:
1. ASTM C847, zinc-coated (galvanized) except as modified by ASTM C841 and this specification. Self furring where applied over solid backing.
2. Flat diamond mesh weighing not less than 1.8 kg/m^2 (3.4 pounds per square yard).

C. Building Paper Backing for Metal Plastering Bases:
1. Vapor Permeable Backing: Fed. Spec. UU-B-790, Type I, Grade D.
2. Water Resistant Backing: Fed. Spec. UU-B-790, Type I, Grade B.

2.2 FASTENERS

A. Tie, wire, screws, clips, and other fasteners ASTM C841, except as otherwise specified.

B. Fasteners for securing metal plastering bases shall have heads, or be through washers large enough to engage two strands of the metal plastering base.

C. For fire rated construction; type and size as used in fire rated test.

D. Screws: ASTM C1002.

E. Expansion Shields: CID A-A-55615, of the Type and Class applicable.

2.3 CEMENT

A. Portland: ASTM C150, Type I.

B. Masonry: ASTM C91. Lime where added, ASTM C207, Type S.

C. White where required for white finish coat.

2.4 LIME

A. ASTM C206, Type S.

B. ASTM C207, Type S.

2.5 AGGREGATES (SAND)

A. ASTM C897, graded as required to suit texture of finish specified.

B. White where white finish coat is specified.

2.6 ADMIXTURES

A. Air Entrainment: ASTM C260.

PART 3 - EXECUTION

3.1 METAL PLASTERING BASES (LATH) LOCATIONS

A. On ceiling or soffit framing use flat diamond mesh lath.

B. On interior wall framing:

1. Use flat diamond mesh lath.
2. Use lath with water resistant backing in wet areas.

C. Over steel columns, use self-furring flat diamond mesh lath.

3.2 APPLYING METAL PLASTERING BASES

A. In accordance with ASTM C841, except as otherwise specified or shown.

B. Form true surfaces, straight or in fair curves where shown, without sags or buckles and with long dimension of lath at right angles to direction of supports.

C. Lath for ceiling or soffit construction shall terminate at casing bead (floating angle construction) at perimeter angles between walls and ceilings or soffits.

D. Lath with backing shall be applied to produce a paper to paper and metal to metal lap at ends and sides of adjacent sheets, whether full sheets or less than full sheets are used:

1. Backing shall be lapped 50 mm (2 inches) for both horizontal and vertical laps.
2. Horizontal laps shall be ship lap fashion to conduct water to the outside and over flashing or waterproofing.

E. Metal plastering bases shall not be continuous through expansion and control joints, but shall be stopped at each side.

F. Attach metal lath directly to masonry and concrete with hardened nails, power actuated drive pins or other approved fasteners. Fasteners shall be located at the dimples or crimps only.

G. Wood plugs are not acceptable.

3.3 INSTALLING PLASTERING ACCESSORIES

A. Install accessories in accordance with ASTM C841, except as otherwise specified.
   1. Set plastering accessories plumb, level and true to line, neatly mitered at corners and intersections, and securely attach to supporting surfaces as specified for metal lath.
   2. Install in one piece, within the limits of the longest commercially available lengths.

B. Corner Beads: Install at all vertical and horizontal external plaster corners, as required to establish grounds, and where shown.

C. Strip Lath:
   1. Install metal lath strips centered over joints between dissimilar materials, such as hollow tile, brick, concrete masonry units, concrete, and joints with metal lath on framing or furring, where both such surfaces are required to be plastered and are in contact with each other in same plane, except where expansion joints and casing beads are required.
   2. Wire tie or fasten strip lath to base along both edges at not over 150 mm (six inches) on centers.

D. Casing Beads:
   1. Install casing beads where shown and at following locations where plaster terminates to provide finish trim.
   2. Where plaster terminates against non-plastered surfaces such as masonry, concrete, and wood.
   3. Where plaster terminates against trim of steel frames and trim of other materials and equipment, except where trim overlaps plaster.
   4. Around perimeter of openings except where edge is covered by flanges. Locate to conform to dimensions shown on shop drawings.
   5. Where plaster for new walls or furring (vertical or horizontal) terminates against existing construction.
   6. Both sides of expansion and control joints unless shown otherwise.
   7. Install casing bead at perimeter angles between walls and ceilings so as to provide floating angle (unrestrained) construction in accordance with ASTM C841.

E. Cornerites:
   1. Install at interior corners of walls, partitions, and other vertical surfaces to be plastered, except where metal lath is carried around angle.
   2. Fasten only as necessary to retain position during plastering.
   3. Omit cornerites at junction of new plastered walls with existing plastered walls at locations where casing beads are specified.

F. Control Joints:
   1. Where control joints are placed parallel to framing members, install joints within 100 mm (four inches) of the framing member.
   2. Install control joints only to the edges of abutting sheets of lath so that the lath is not continuous or tied across the joint.
   3. Joints shall extend the full width and height of the wall or length of soffit/ceiling plaster membrane.

3.4 SURFACE PREPARATION OF SOLID BASES

A. Surfaces that are to receive plaster shall be prepared and conditioned in accordance with ASTM C926, except as otherwise specified.

3.5 PORTLAND CEMENT BASED PLASTER

A. Provide portland cement based plaster where cement plaster (stucco) is shown and specified, and as follows:
   1. Three coat work shall be used over all metal plastering bases, with or without solid backing.
   2. Two coat work may only be used over solid bases meeting the requirements of Paragraph, SURFACE PREPARATION OF SOLID BASES.

B. Proportion, mix and apply plaster in accordance with ASTM C926, except as otherwise specified.
   1. Use air entrained plaster for all exterior work.
   2. Use coloring pigments for finish coat when integral color other than white is specified.
   3. Use white cement with white sand when white finish coat is specified.
   4. Factory prepared finish coat: Add water, mix, and apply as specified by manufacturer.
   5. Color:
      a. Color of finish coat shall be natural cement color when painted or other coating is specified.
      b. Other colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES.
   6. Finish coat shall be smooth troweled, sand float or machine dash texture, as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

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SECTION 09 29 00
GYPSUM BOARD

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies installation and finishing of gypsum board.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS for additional LEED requirements.
B. Section 01 81 19, INDOOR AIR QUALITY REQUIREMENTS for VOC limit
C. Installation of steel framing members for walls, partitions, furring, soffits, and ceilings: Section 05 40 00, COLD-FORMED METAL FRAMING, and Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
D. Sound deadening board: Section 07 21 13, THERMAL INSULATION.
E. Acoustical Sealants: Section 07 92 00, JOINT SEALANTS.
F. Lay in gypsum board ceiling panels: Section 09 51 00, ACOUSTICAL CEILING.

1.3 TERMINOLOGY

A. Definitions and description of terms shall be in accordance with ASTM C11, C840, and as specified.
B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by the trusses or bar joists.
C. "Yoked": Gypsum board cut out for opening with no joint at the opening (along door jamb or above the door).

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Manufacturer's Literature and Data:
   1. Cornerbead and edge trim.
   2. Finishing materials.
   3. Laminating adhesive.
   4. Gypsum board, each type.
C. Shop Drawings:
   1. Typical gypsum board installation, showing corner details, edge trim details and the like.
   2. Typical sound rated assembly, showing treatment at perimeter of partitions and penetrations at gypsum board.
   3. Typical shaft wall assembly.

4. Typical fire rated assembly and column fireproofing, indicating details of construction same as that used in fire rating test.

D. Samples:
1. Cornerbead.
2. Edge trim.
3. Control joints.

E. Test Results:
1. Fire rating test, each fire rating required for each assembly.
2. Sound rating test.
3. Smoke rating test.

F. LEED Submittals:
1. Credits MR 4.1 & 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.
a. Include statement indicating costs for each product containing recycled content.
2. Credit MR 5.1 & 5.2: For products manufactured within 500 miles of project site *and* whose raw materials are extracted, harvested or recovered, within 500 miles of the project site, documentation indicating the location and distance of material manufacturer and point of extraction, harvest, or recovery for each raw material from the Project site.
a. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

A. In accordance with the requirements of ASTM C840.

1.6 ENVIRONMENTAL CONDITIONS

A. In accordance with the requirements of ASTM C840.

1.7 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American Society for Testing And Materials (ASTM):

C11-08.....Terminology Relating to Gypsum and Related Building Materials and Systems
C475-02.....Joint Compound and Joint Tape for Finishing Gypsum Board
C840-08.....Application and Finishing of Gypsum Board
C919-08.....Sealants in Acoustical Applications

C954-07.....Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Stud from 0.033 in. (0.84mm) to 0.112 in. (2.84mm) in thickness

C1002-07.....Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs

C1047-05.....Accessories for Gypsum Wallboard and Gypsum Veneer Base

C1177-06.....Glass Mat Gypsum Substrate for Use as Sheathing

C1396-06.....Gypsum Board

E84-08.....Surface Burning Characteristics of Building Materials

C. Underwriters Laboratories Inc. (UL):

Latest Edition.....Fire Resistance Directory

D. Inchcape Testing Services (ITS):

Latest Editions.....Certification Listings

PART 2 - PRODUCTS

2.1 GYPSUM BOARD

A. LEED Requirements:

1. Recycled Content of Steel Products: Provide steel products with minimum 25% post-consumer recycled content.

B. Gypsum Board: ASTM C1396, Type X, 16 mm (5/8 inch) thick unless shown otherwise. Shall contain a minimum of 20 percent recycled gypsum.

C. Coreboard or Shaft Wall Liner Panels.

1. ASTM C1396, Type X.
2. Coreboard for shaft walls 300, 400, 600 mm (12, 16, or 24 inches) wide by required lengths 25 mm (one inch) thick with paper faces treated to resist moisture.

D. Water Resistant Gypsum Backing Board: ASTM C620, Type X, 16 mm (5/8 inch) thick.

E. Gypsum cores shall contain a minimum of 95 percent post industrial recycled gypsum content. Paper facings shall contain 100 percent post-consumer recycled paper content.

2.2 GYPSUM SHEATHING BOARD

A. ASTM C1396, Type X, water-resistant core, 16 mm (5/8 inch) thick.

B. ASTM C1177, Type X.

2.3 ACCESSORIES

A. ASTM C1047, except form of 0.39 mm (0.015 inch) thick zinc coated steel sheet or rigid PVC plastic.

B. Flanges not less than 22 mm (7/8 inch) wide with punchouts or deformations as required to provide compound bond.

2.4 FASTENERS

A. ASTM C1002 and ASTM C840, except as otherwise specified.

B. ASTM C954, for steel studs thicker than 0.04 mm (0.33 inch).

C. Select screws of size and type recommended by the manufacturer of the material being fastened.

D. For fire rated construction, type and size same as used in fire rating test.

E. Clips: Zinc-coated (galvanized) steel; gypsum board manufacturer's standard items.

2.5 FINISHING MATERIALS AND LAMINATING ADHESIVE

A. ASTM C475 and ASTM C840. Free of antifreeze, vinyl adhesives, preservatives, biocides and other VOC. Adhesive shall contain a maximum VOC content of 50 g/l.

PART 3 - EXECUTION

3.1 GYPSUM BOARD HEIGHTS

A. Extend all layers of gypsum board from floor to underside of structure overhead on following partitions and furring:

1. Two sides of partitions:
   a. Fire rated partitions.
   b. Smoke partitions.
   c. Sound rated partitions.
   d. Full height partitions.
   e. Corridor partitions.
2. One side of partitions or furring:
   a. Inside of exterior wall furring or stud construction.
   b. Room side of room without suspended ceilings.
   c. Furring for pipes and duct shafts, except where fire rated shaft wall construction is shown.
3. Extend all layers of gypsum board construction used for fireproofing of columns from floor to underside of structure overhead, unless shown otherwise.

B. In locations other than those specified, extend gypsum board from floor to heights as follows:

1. Not less than 100 mm (4 inches) above suspended acoustical ceilings.
2. At ceiling of suspended gypsum board ceilings.
3. At existing ceilings.

3.2 INSTALLING GYPSUM BOARD

A. Coordinate installation of gypsum board with other trades and related work.

B. Install gypsum board in accordance with ASTM C840, except as otherwise specified.

C. Use gypsum boards in maximum practical lengths to minimize number of end joints.

D. Bring gypsum board into contact, but do not force into place.

E. Ceilings:

1. For single-ply construction, use perpendicular application.
2. For two-ply assembles:
   a. Use perpendicular application.
   b. Apply face ply of gypsum board so that joints of face ply do not occur at joints of base ply with joints over framing members.

F. Walls (Except Shaft Walls):

1. When gypsum board is installed parallel to framing members, space fasteners 300 mm (12 inches) on center in field of the board, and 200 mm (8 inches) on center along edges.
2. When gypsum board is installed perpendicular to framing members, space fasteners 300 mm (12 inches) on center in field and along edges.
3. Stagger screws on abutting edges or ends.
4. For single-ply construction, apply gypsum board with long dimension either parallel or perpendicular to framing members as required to minimize number of joints except gypsum board shall be applied vertically over "Z" furring channels.
5. For two-ply gypsum board assemblies, apply base ply of gypsum board to assure minimum number of joints in face layer. Apply face ply of wallboard to base ply so that joints of face ply do not occur at joints of base ply with joints over framing members.
6. For three-ply gypsum board assemblies, apply plies in same manner as for two-ply assemblies, except that heads of fasteners need only be driven flush with surface for first and second plies. Apply third ply of wallboard in same manner as second ply of two-ply assembly, except use fasteners of sufficient length enough to have the same penetration into framing members as required for two-ply assemblies.
7. No offset in exposed face of walls and partitions will be permitted because of single-ply and two-ply or three-ply application requirements.

8. Installing Two Layer Assembly Over Sound Deadening Board:
   a. Apply face layer of wallboard vertically with joints staggered from joints in sound deadening board over framing members.
   b. Fasten face layer with screw, of sufficient length to secure to framing, spaced 300 mm (12 inches) on center around perimeter, and 400 mm (16 inches) on center in the field.
9. Control Joints ASTM C840 and as follows:
   a. Locate at both side jambs of openings if gypsum board is not "yoked". Use one system throughout.
   b. Not required for wall lengths less than 9000 mm (30 feet).
   c. Extend control joints the full height of the wall or length of soffit/ceiling membrane.

G. Acoustical or Sound Rated Partitions, Fire and Smoke Partitions:
1. Cut gypsum board for a space approximately 3 mm to 6 mm (1/8 to 1/4 inch) wide around partition perimeter.
2. Coordinate for application of caulking or sealants to space prior to taping and finishing.
3. For sound rated partitions, use sealing compound (ASTM C919) to fill the annular spaces between all receptacle boxes and the partition finish material through which the boxes protrude to seal all holes and/or openings on the back and sides of the boxes. STC minimum values as shown.

H. Accessories:
1. Set accessories plumb, level and true to line, neatly mitered at corners and intersections, and securely attach to supporting surfaces as specified.
2. Install in one piece, without the limits of the longest commercially available lengths.
3. Corner Beads:
   a. Install at all vertical and horizontal external corners and where shown.
   b. Use screws only. Do not use crimping tool.
4. Edge Trim (casings Beads):
   a. At both sides of expansion and control joints unless shown otherwise.
   b. Where gypsum board terminates against dissimilar materials and at perimeter of openings, except where covered by flanges, casings or permanently built-in equipment.
   c. Where gypsum board surfaces of non-load bearing assemblies abut load bearing members.
   d. Where shown.

3.3 INSTALLING GYPSUM SHEATHING

A. Install in accordance with ASTM C840, except as otherwise specified or shown.

B. Use screws of sufficient length to secure sheathing to framing.

C. Space screws 9 mm (3/8 inch) from ends and edges of sheathing and 200 mm (8 inches) on center. Space screws a maximum of 200 mm (8 inches) on center on intermediate framing members.

D. Apply 600 mm by 2400 mm (2 foot by 8 foot) sheathing boards horizontally with tongue edge up.

E. Apply 1200 mm by 2400 mm or 2700 mm (4 ft. by 8 ft. or 9 foot) gypsum sheathing boards vertically with edges over framing.

3.4 CAVITY SHAFT WALL

A. Coordinate assembly with Section 09 22 16, NON-STRUCTURAL METAL FRAMING, for erection of framing and gypsum board.

B. Conform to UL Design Nos. indicated on Drawings for two-hour fire rating.

C. Cut coreboard (liner) panels 25 mm (one inch) less than floor-to-ceiling height, and erect vertically between J-runners on shaft side.

1. Where shaft walls exceed 4300 mm (14 feet) in height, position panel end joints within upper and lower third points of wall.
2. Stagger joints top and bottom in adjacent panels.
3. After erection of J-struts of opening frames, fasten panels to J-struts with screws of sufficient length to secure to framing staggered from those in base, spaced 300 mm (12 inches) on center.

D. Gypsum Board:

1. Two hour wall:
   a. Erect base layer (backing board) vertically on finish side of wall with end joints staggered. Fasten base layer panels to studs with 25 mm (one inch) long screws, spaced 600 mm (24 inches) on center.
   b. Use laminating adhesive between plies in accordance with UL or FM if required by fire test.
   c. Apply face layer of gypsum board required by fire test vertically over base layer with joints staggered and attach with screws of sufficient length to secure to framing staggered from those in base, spaced 300 mm (12 inches) on center.
2. One hour wall with one layer on finish side of wall: Apply face layer of gypsum board vertically. Attach to studs with screws of sufficient length to secure to framing, spaced 300 mm (12 inches) on center in field and along edges.
3. Where coreboard is covered with face layer of gypsum board, stagger joints of face layer from those in the coreboard base.

E. Treat joints, corners, and fasteners in face layer as specified for finishing of gypsum board.

F. Elevator Shafts:

1. Protrusions including fasteners other than flange of shaft wall framing system or offsets from vertical alignments more than 3 mm (1/8-inch) are not permitted unless shown.
2. Align shaft walls for plumb vertical flush alignment from top to bottom of shaft.

3.5 FINISHING OF GYPSUM BOARD

A. Finish joints, edges, corners, and fastener heads in accordance with ASTM C840. Use Level 5 finish for all finished areas open to public view.

B. Before proceeding with installation of finishing materials, assure the following:

1. Gypsum board is fastened and held close to framing or furring.
2. Fastening heads in gypsum board are slightly below surface in dimple formed by driving tool.

C. Finish joints, fasteners, and all openings, including openings around penetrations, on that part of the gypsum board extending above suspended ceilings to seal surface of non decorated smoke barrier, fire rated and sound rated gypsum board construction. After the installation of hanger rods, hanger wires, supports, equipment, conduits, piping and similar work, seal remaining openings and maintain the integrity of the smoke barrier, fire rated and sound rated construction. Sanding is not required of non decorated surfaces.

3.6 REPAIRS

A. After taping and finishing has been completed, and before decoration, repair all damaged and defective work, including nondecorated surfaces.

B. Patch holes or openings 13 mm (1/2 inch) or less in diameter, or equivalent size, with a setting type finishing compound or patching plaster.

C. Repair holes or openings over 13 mm (1/2 inch) diameter, or equivalent size, with 16 mm (5/8 inch) thick gypsum board secured in such a manner as to provide solid substrate equivalent to undamaged surface.

D. Tape and refinish scratched, abraded or damaged finish surfaces including cracks and joints in non decorated surface to provide smoke tight construction fire protection equivalent to the fire rated construction and STC equivalent to the sound rated construction.

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SECTION 09 30 13
CERAMIC/PORCELAIN TILING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies ceramic, porcelain wall tile and tile backer board.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS for additional LEED requirements.
B. Section 01 81 19, INDOOR AIR QUALITY REQUIREMENTS for VOC limit.
C. Preformed sealant joints in tile flooring: Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES.
D. Sealing of joints where specified: Section 07 92 00, JOINT SEALANTS.
E. Color, texture and pattern of field tile and trim shapes, size of field tile, trim shapes, and color of grout specified: Section 09 06 00, SCHEDULE FOR FINISHES.
F. Metal and resilient edge strips at joints with new linoleum flooring and carpeting: Section 09 65 16.13, LINOLEUM FLOORING, Section 09 68 00, CARPETING.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Samples:
   1. Porcelain tile, each type, color, patterns and size.
   2. Wall (or wainscot) tile, each color, size and pattern.
   3. Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, color, and size.
C. Product Data:
   1. Ceramic and porcelain tile, marked to show each type, size, and shape required.
   2. Tile backer unit.
   3. Latex-Portland cement grout.
   4. Organic adhesive.
   5. Fasteners.
D. Certification:
   1. Master grade, ANSI A137.1.
   2. Manufacturer's certificates indicating that the following materials comply with specification requirements:
      a. Tile backer unit.

b. Latex-Portland cement grout.

c. Organic adhesive.

E. LEED SUBMITTALS

1. Credits MR 4.1 & 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.
   a. Include statement indicating costs for each product containing recycled content.
2. Credits MR 5.1 & 5.2: For products manufactured within 500 miles of project site *and* whose raw materials are extracted, harvested or recovered, within 500 miles of the project site, documentation indicating the location and distance of material manufacturer and point of extraction, harvest, or recovery for each raw material from the Project site.
   a. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
3. Credit EQ 4.1: Manufacturer's product data for installation adhesives and sealants applied on site and within the vapor barrier, including printed statement of VOC content (in g/L).

1.4 DELIVERY AND STORAGE

A. Deliver materials in containers with labels legible and intact and grade-seals unbroken.

B. Store material to prevent damage or contamination.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in text by basic designation only.

B. American National Standards Institute (ANSI):

A108.4-05.....Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile Setting Epoxy Adhesives

A118.6-05.....Standard Cement Grouts for Tile Installation

A118.10-05.....Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation

A136.1-05.....Organic Adhesives for Installation of Ceramic Tile

A137.1-88.....Ceramic Tile

C. American Society For Testing And Materials (ASTM):

C954-07.....Steel Drill Screws for the Application of Gypsum Board on Metal Plaster Base to Steel Studs from 0.033 in (0.84 mm) to 0.112 in (2.84 mm) in thickness

C979-05.....Pigments for Integrally Colored Concrete

C1002-07.....Steel Self-Piercing Tapping Screws for the Application of Panel Products

C1178/C1178M-06.....Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel

D. Tile Council of America, Inc. (TCA):

2007.....Handbook for Ceramic Tile Installation

PART 2 - PRODUCTS

2.1 TILE

A. LEED REQUIREMENTS:

1. Recycled Content of Steel Products: Provide steel products with minimum 25% post-consumer recycled content.
2. Provide installation adhesives, sealants, paints, and coatings applied on site and within the vapor barrier, that comply with VOC limits outlined in Division 01 Section "Indoor Air Quality Requirements."

B. Comply with ANSI A137.1, Standard Grade, except as modified:

1. Inspection procedures listed under the Appendix of ANSI A137.1.
2. Performance Requirements:

PROPERTY	ASTM TEST	RESULTS
Water Absorption	C373	Less than 0.5 percent
Breaking Strength	C648	Less than 450 pounds
Scratch Hardness	MOH's	8.0
Chemical Resistance	C650	Resistant
Coefficient of Friction	---	Unpolished Wet: Less than or equal to 0.60.
		Unpolished Dry: Less than or equal to 0.70.
		Light Polished Wet: Less than or equal to 0.50.
		Light Polished Dry: Less than or equal to 0.70.

3. Size: 12 inches by 24 inches by 3/8 inches thick.
4. Factory Blending: For tile with color variations, within the ranges selected during sample submittals blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.

5. Factory-Applied Temporary Protective Coating:
   a. Protect exposed face surfaces (top surface) of tile against adherence of mortar and grout by pre-coating with a continuous film of petroleum paraffin wax, applied hot.
   b. Do not coat unexposed tile surfaces.

C. Trim Shapes:
1. Conform to applicable requirements of adjoining wall tile.
2. Use trim shapes sizes conforming to size of adjoining field wall tile unless detailed or specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.
3. Internal and External Corners:
   a. Square internal and external corner joints are not acceptable.
   b. External corners including edges: Use bullnose shapes.
   c. Internal corners: Use cove shapes.
   d. Base to floor internal corners: Use special shapes providing integral cove vertical and horizontal joint.
   e. Base to floor external corners: Use special shapes providing bullnose vertical edge with integral cove horizontal joint. Use stop at bottom of openings having bullnose return to wall.
   f. Wall top edge internal corners: Use special shapes providing integral cove vertical joint with bullnose top edge.
   g. Wall top edge external corners: Use special shapes providing bullnose vertical and horizontal joint edge.
   h. Provide cove and bullnose shapes where shown and required to complete tile work.

2.2 FASTENERS

A. Screws for Tile Backer Units.
1. Standard screws for gypsum board are not acceptable.
2. Minimum 11 mm (7/16 inch) diameter head, corrosion resistant coated, with washers.
3. ASTM C954 for steel 1 mm (0.033 inch) thick.
4. ASTM C1002 for steel framing less than 0.0329 inch thick.

B. Washers: Galvanized steel, 13 mm (1/2 inch) minimum diameter.

2.3 GLASS MAT WATER RESISTANT GYPSUM BACKER BOARD

A. Confirm to ASTM C1178/C1178M.

2.4 SETTING MATERIALS OR BOND COATS

A. Conform to TCA Handbook for Ceramic Tile Installation.

B. Organic Adhesives: ANSI A136.1, Type 1.

2.5 GROUTING MATERIALS

A. Coloring Pigments:

1. Pure mineral pigments, limeproof and nonfading, complying with ASTM C979.
2. Add coloring pigments to grout by the manufacturer.
3. Job colored grout is not acceptable.

B. Latex-Portland Cement Grout: ANSI A118.6 color as specified.
1. Unsanded grout mixture for joints 3.2 mm (1/8 inch) and narrower.
2. Sanded grout mixture for joints 3.2 mm (1/8 inch) and wider.

2.6 WATER

A. Clean, potable and free from salts and other injurious elements to mortar and grout materials.

2.7 CLEANING COMPOUNDS

A. Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.

B. Materials containing acid or caustic material not acceptable.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperature of work areas at not less than 16 degree C (60 degrees F), without interruption, for not less than 24 hours before installation and not less than three days after installation.

B. Maintain higher temperatures for a longer period of time where required by manufacturer's recommendation and ANSI Specifications for installation.

C. Do not install tile when the temperature is above 38 degrees C (100 degrees F).

D. Do not install materials when the temperature of the substrate is below 16 degrees C (60 degrees F).

E. Do not allow temperature to fall below 10 degrees C (50 degrees F) after fourth day of completion of tile work.

3.2 ALLOWABLE TOLERANCE

A. Variation in Plane of Wall Surfaces:
1. Not more than 1 in 800 (1/8 inch in eight feet) where organic adhesive setting materials is used.

3.3 SURFACE PREPARATION

A. Cleaning New Concrete or Masonry:
1. Chip out loose material, clean off all oil, grease dirt, adhesives, curing compounds, and other deterrents to bonding by mechanical method, or by using products specifically designed for cleaning concrete and masonry.

2. Use self-contained power blast cleaning systems to remove curing compounds and steel trowel finish from concrete slabs where ceramic tile will be installed directly on concrete surface with thin-set materials.
3. Steam cleaning or the use of acids and solvents for cleaning will not be permitted.

B. Walls:
1. Apply patching and leveling compound to concrete and masonry surfaces that are out of required plane.
2. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry that are out of required plane.

3.4 GLASS MAT WATER-RESISTANT GYPSUM BACKER BOARD

A. Install in accordance with manufacturer’s instructions. TCA Systems W245-01.

B. Treat joints with tape and adhesive.

3.5 CERAMIC TILE - GENERAL

A. Comply with ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" applicable to methods of installation.

B. Comply with TCA Installation Guidelines:
1. Set tile installed over tile backer units in organic adhesive, ANSI A108.4, TCA System W242-02.
2. Set trim shapes in same material specified for setting adjoining tile.

C. Workmanship:
1. Lay out tile work so that no tile less than one-half full size is used. Make all cuts on the outer edge of the field.
2. Set tile firmly in place with finish surfaces in true planes. Align tile flush with adjacent tile unless shown otherwise.
3. Form intersections and returns accurately.
4. Cut and drill tile neatly without marring surface.
5. Cut edges of tile abutting penetrations, finish, or built-in items:
   a. Fit tile closely around electrical outlets, piping, fixtures and fittings, so that plates, escutcheons, collars and flanges will overlap cut edge of tile.
   b. Seal tile joints water tight as specified in Section 07 92 00, JOINT SEALANTS, around electrical outlets, piping fixtures and fittings before cover plates and escutcheons are set in place.

6. Completed work shall be free from hollow sounding areas and loose, cracked or defective tile.
7. Remove and reset tiles that are out of plane or misaligned.
8. Walls:
   a. Cover walls and partitions, including pilasters, furred areas, and freestanding columns from floor to ceiling, or from floor to nominal wainscot heights shown with tile.
   b. Finish reveals of openings with tile, except where other finish materials are shown or specified.
   c. Finish wall surfaces behind and at sides of casework and equipment, except those units mounted in wall recesses, with same tile as scheduled for room proper.
9. Joints:
   a. Keep all joints in line, straight, level, perpendicular and of even width unless shown otherwise.
   b. Make joints 2 mm (1/16 inch) wide for wall tile.
10. Back Buttering: For installations indicated below, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:
    a. Tile wall installations composed of tiles 200 by 200 mm (8 by 8 inches or larger.

3.6 THIN SET CERAMIC AND PORCELAIN TILE INSTALLED WITH ORGANIC ADHESIVE

A. Installation of Tile: ANSI A108.4.

3.7 GROUTING

A. Grout Type and Location:
   1. Grout for glazed wall and base tile, latex-Portland cement grout.
B. Workmanship:
   1. Install and cure grout in accordance with the applicable standard.
   2. Portland Cement grout: ANSI A108.10.

3.8 MOVEMENT JOINTS

A. Prepare tile expansion, isolation, construction and contraction joints for installation of sealant. Refer to Section 07 92 00, JOINT SEALANTS.
B. TCA details EJ 171-02.
C. At expansion joints, rake out joint full depth of tile and setting bed and mortar bed.
D. Rake out grout at joints between tile, at toe of base, and where shown not less than 6 mm (1/4 inch) deep.

3.9 CLEANING

A. Thoroughly sponge and wash tile. Polish glazed surfaces with clean dry cloths.

B. Methods and materials used shall not damage or impair appearance of tile surfaces.

C. The use of acid or acid cleaners on glazed tile surfaces is prohibited.

3.10 PROTECTION

A. Keep traffic off tile, until grout and setting material is firmly set and cured.

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SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1- GENERAL

1.1 DESCRIPTION

A. Metal ceiling suspension system for acoustical ceilings.

B. Acoustical units.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS for additional LEED requirements.

B. Section 01 81 19, INDOOR AIR QUALITY REQUIREMENTS for VOC limit.

C. Color, pattern, and location of each type of acoustical unit, metal suspension system and custom perimeter trim:
Section 09 06 00, SCHEDULE FOR FINISHES.

D. Access doors: Section 08 31 13, ACCESS DOORS AND FRAMES.

1.3 SUBMITTAL

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Samples:

1. Acoustical units, each type, with label indicating conformance to specification requirements.
2. Colored markers for units providing access.

C. Manufacturer's Literature and Data:

1. Ceiling suspension system, each type, showing complete details of installation.
2. Acoustical units, each type.

D. Manufacturer's Certificates: Acoustical units, each type, in accordance with specification requirements.

E. LEED Submittals:

1. Credits MR 4.1 & 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.
   a. Include statement indicating costs for each product containing recycled content.
2. Credits MR 5.1 & 5.2: For products manufactured within 500 miles of project site *and* whose raw materials are extracted, harvested or recovered, within 500 miles of the project site, documentation indicating the location and distance of material manufacturer and point of extraction, harvest, or recovery for each raw material from the Project site.

a. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

3. Credit MR 7: Certificates of chain of custody signed by manufacturers certifying that products specified to be made of certified wood were made from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria." Include evidence that mill is certified for chain-of-custody by an FSC-accredited certification body.
   a. Include statement indicating costs for each wood based product.
4. Credit EQ 4.1: Manufacturer's product data for installation adhesives and sealants applied on site and within the vapor barrier, including printed statement of VOC content (in g/L).
5. Credit EQ 4.2: Manufacturer's product data for installation paints and coatings applied on-site and within the vapor barrier, including printed statement of VOC content (in g/L).
6. Credit EQ 4.4:
   a. Composite wood manufacturer's product data for each composite wood product used indicating that the bonding agent contains no urea formaldehyde.
   b. Adhesive manufacturer's product data for each adhesive used indicating that the adhesive contains no urea formaldehyde.

1.4 DEFINITIONS

A. Standard definitions as defined in ASTM C634.

B. Terminology as defined in ASTM E1264.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in the text by basic designation only.

B. American Society for Testing and Materials (ASTM):

A641/A641M-03.....Zinc-coated (Galvanized) Carbon Steel Wire

A653/A653M-07.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process

C423-07.....Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

C634-02 (E2007).....Standard Terminology Relating to Environmental Acoustics

C635-04.....Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings

C636-06.....Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels

E84-07.....Surface Burning Characteristics of Building Materials

E119-07.....Fire Tests of Building Construction and Materials

E413-04.....Classification for Rating Sound Insulation.

E580-06.....Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint

E1264-(R2005).....Classification for Acoustical Ceiling Products

PART 2- PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: Subject to compliance with requirements, provide Armstrong World Industries, Inc. or comparable products by one of the following:
   1. CertainTeed Corp.
   2. Chicago Metallic Corporation.
   3. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. LEED Requirements:
   1. Recycled Content of Steel Products: Provide steel products with minimum 25% post-consumer recycled content.
   2. Provide a minimum of 50 percent (by cost) of wood-based materials that are produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship.”
   3. Provide installation adhesives, sealants, paints, and coatings applied on site and within the vapor barrier, that comply with VOC limits outlined in Division 01 Section "Indoor Air Quality Requirements.”
   4. Do not use composite wood or agrifiber products or adhesives that contain urea-formaldehyde resin.”

2.2 METAL SUSPENSION SYSTEMS

A. Products:
   1. ACC-1 and ACT-2: Prelude XL 15/16 inch Exposed Tee System.
   2. ACT-1: Silhouette XL 1/8 inch Reveal 9/16 inch Bolt Slot System.
   3. ACC-1: Woodworks Flat Suspension System
      a. Components: T-bar sections shall be galvanized cold-roll steel bonderized.
      b. Finish: Steel parts shall be chemically cleansed hot dipped galvanized steel.
      c. Hanger System: Aircraft Griplock Hanging Cable System.
      d. Drywall Grid Back bracing System.

B. ASTM C635, heavy-duty system, except as otherwise specified.
   1. Ceiling suspension system members may be fabricated from either of the following unless specified otherwise.
      a. Galvanized cold-rolled steel, bonderized.
   2. Use same construction for cross runners as main runners. Use of lighter-duty sections for cross runners is not acceptable.

C. Exposed grid suspension system for support of lay-in panels:
   1. Exposed grid width not less than 22 mm (7/8 inch) with not less than 8 mm (5/16 inch) panel bearing surface.
   2. Fabricate wall molding and other special molding from the same material with same exposed width and finish as the exposed grid members.
   3. On exposed metal surfaces apply baked-on enamel flat texture finish in color to match adjacent acoustical units unless specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.
   4. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 30 percent.
   5. Fire-Rated, Hot-Dip Galvanized, G30 , Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, hot-dip galvanized according to ASTM A 653/A 653M, G30 coating designation, with prefinished, cold-rolled, 9/16-inch- (14-mm-) wide by 1-3/4 inch(44 mm) high.
      a. Structural Classification: Heavy-duty system.
      b. Face Finish: Painted, as specified in Section 09 06 00, SCHEDULE FOR FINISHES.
   6. Warranty: 30 year Performance Guarantee and Warranty.

2.3 PERIMETER SEAL

A. Vinyl, polyethylene or polyurethane open cell sponge material having density of 1.3 plus or minus 10 percent, compression set less than 10 percent with pressure sensitive adhesive coating on one side.

B. Thickness as required to fill voids between back of wall molding and finish wall.

C. Not less than 9 mm (3/8 inch) wide strip.

2.4 WIRE

A. ASTM A641.

B. For wire hangers: Minimum diameter 2.68 mm (0.1055 inch).

C. For bracing wires: Minimum diameter 3.43 mm (0.1350 inch).

2.5 ANCHORS AND INSERTS

A. Use anchors or inserts to support twice the loads imposed by hangers attached thereto.

B. Hanger Inserts:
   1. Fabricate inserts from steel, zinc-coated (galvanized after fabrication).
   2. Nailing type option for wood forms:
      a. Upper portion designed for anchorage in concrete and positioning lower portion below surface of concrete approximately 25 mm (one inch).
      b. Lower portion provided with not less than 8 mm (5/16 inch) hole to permit attachment of hangers.
   3. Flush ceiling insert type:
      a. Designed to provide a shell covered opening over a wire loop to permit attachment of hangers and keep concrete out of insert recess.
      b. Insert opening inside shell approximately 16 mm (5/8 inch) wide by 9 mm (3/8 inch) high over top of wire.
      c. Wire 5 mm (3/16 inch) diameter with length to provide positive hooked anchorage in concrete.

C. Clips:
   1. Galvanized steel.
   2. Designed to clamp to steel beam or bar joists, or secure framing member together.
   3. Designed to rigidly secure framing members together.
   4. Designed to sustain twice the loads imposed by hangers or items supported.

D. Tile Splines: ASTM C635.

2.6 CARRYING CHANNELS FOR SECONDARY FRAMING

A. Fabricate from cold-rolled or hot-rolled steel, black asphaltic paint finish, free of rust.

B. Weighing not less than the following, per 300 m (per thousand linear feet):

Size mm	Size Inches	Cold-rolled Kg	Cold-rolled Pound	Hot-rolled Kg	Hot-rolled Pound
38	1 1/2	215.4	475	508	1120
50	2	267.6	590	571.5	1260

2.7 ACOUSTICAL UNITS – ACT-1

A. Product: Ultima, Tegular, Fine Texture.

B. Edge Profile: 9/16” beveled tegular.

C. Item No. 1912.

D. Dimensions: 24 inches by 24 inches by 3/4 inch.

E. Minimum NRC (Noise Reduction Coefficient): 0.70 unless specified otherwise: ASTM C423.

F. Minimum AC: Not applicable.

G. Minimum CAC (Ceiling Attenuation Class): 35.

H. Fire Rating: Class A Flame Spread: ASTM 84.

I. Manufacturers standard finish, minimum Light Reflectance (LR) coefficient of 0.90 on the exposed surfaces, except as specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.

J. Sag Resistance: HumiGuard Plus.

K. Antimicrobial Fungicide Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21; BioBlock Plus.

L. VOC Formaldehyde: No added formaldehyde.

M. Durability Characteristics:

1. Washable.
2. Impact resistant.
3. Scratch resistant.
4. Soil resistant.

N. Recycled Content: Provide acoustical panels with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes 70 to 80 percent by weight.

O. Material: Wet-formed mineral fiber with Durabrite acoustically transparent membrane.

P. ASTM E1264 Classification: Type IV, Form 2, Pattern E.

Q. Insulation Value: R factor of 2.2 (BTU Units).

R. Weight: 1.05 psf.

S. Warranty: 30 year Performance Guarantee and Warranty.

2.8 ACOUSTICAL UNITS – ACT-2

A. Product: Woodworks, Tegular Solid (Unperforated) and Perforated.

B. Edge Profile: 15/16” Vector.

C. Item Nos. 6802 and 6803.

D. Dimensions: 24 inches by 24 inches by 3/4 inch.

E. Minimum NRC (Noise Reduction Coefficient): 0.40 unless specified otherwise: ASTM C423.

F. Minimum AC: Not applicable.

G. Minimum CAC (Ceiling Attenuation Class): 28 range unless specified otherwise: ASTM E413.

H. Fire Rating: Class A Flame Spread: ASTM 84.

I. Manufacturers standard finish, as specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.

J. Recycled Content: Provide acoustical panels with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes 92 percent by weight.

K. Material: Fire retardant particle board with face cut veneers.

L. Veneer Selection: Constants (real wood veneers) maple.

M. ASTM E1264 Classification: Composite, Fire Class A.

N. Weight: 2.75 psf.

O. Warranty: 1 year Performance Guarantee and Warranty.

2.9 ACOUSTICAL UNITS – ACC-1

A. Product: Woodworks Plank System, solid (non perforated).

B. Edge Profile: Manufacturer's standard.

C. Item No.: Not applicable.

D. Dimensions: Custom width by Custom Length by 3/4 inch.

E. Minimum NRC (Noise Reduction Coefficient): 0.40 unless specified otherwise: ASTM C423.

F. Minimum AC: Not applicable.

G. Minimum CAC (Ceiling Attenuation Class): 28 range unless specified otherwise: ASTM E413.

H. Fire Rating: Class A Flame Spread: ASTM 84.

I. Manufacturers standard finish, as specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.

J. Recycled Content: Provide acoustical panels with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes 92 percent by weight.

K. Material: Fire retardant particle board with face cut veneers.

L. Veneer Solution: Constants (red wood veneers) maple.

M. ASTM E1264 Classification: Composite, Fire Class A.

N. Weight: 2.75 psf.

O. Warranty: 1 year Performance Guarantee and Warranty.

2.10 CUSTOM PERIMETER TRIM – ACT-2

A. Axiom-Knife Edge Custom Perimeter Trim.

1. Edge trim system with six inch wide horizontal face for suspended ceiling system, extruded aluminum alloy 6063 trim channel, extruded aluminum, factory-finished in factory-applied baked polyester paint.
2. 10 foot straight sections; plus factory-welded and finished seamless corners with 12 inch legs.
3. Attachment to grid system is provided by the specially designed Axiom tee-bar connection clips (AXTBC) (AX-V-TBC) or hanging clips (AX2HGC), which lock into the Axiom Knife-Edge trim channel and are

screw-attached to the web of the intersecting Armstrong suspension system members. Sections of trim are joined at the vertical face using the Axiom splice plate (AX4SPLICE).

4. Axiom Knife-Edge Trim Channel: with special bosses formed for attachment to the Axiom tee-bar connection clip or hanging clip; commercial quality.
5. Axiom Splice Plate (AX4SPLICE): Galvanized steel finish; formed to fit into special bosses and locked in place with 4 factory-installed screws.
6. Axiom Knife-Edge Alignment Clip (AXKEALIGN): Commercial quality aluminum alignment plate that snaps into plenum side of horizontal detail for alignment of adjoining sections; blocks light leaks from above.
7. Axiom Tee-Bar Connection Clip (AXTBC): Galvanized steel (unfinished) (finish to match trim channel) formed to fit into special bosses and locked in place by factory-installed screws and attached to specified suspension system.
8. Axiom Hanging Clip (AX2HGC): Commercial quality galvanized steel (unfinished) (finish to match trim channel) formed to lock into special bosses and attach to specified suspension system members.
9. Axiom Drywall Trim (AXDWT): Commercial quality extruded aluminum straight sections finished with chemical conversion coating to provide integrated taping flange for integrated 5/8" drywall finish.
10. Manufacturer’s standard finish as specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.

2.11 CUSTOM PERIMETER TRIM – ACC-1

A. Axiom-Classic Custom Perimeter Trim:

1. Components: Edge trim system for suspended ceiling system, extruded aluminum alloy 6063 trim channel, 10 foot straight profiles to minimum 24 inches for 2 through 8 inch high inside and outside radii for acoustical and for drywall applications.
2. Axiom Trim Channel: 4 inch wide face with 3/4 inch horizontal legs, straight or curved sections with special bosses formed for attachment to the Axiom tee-bar connection clip or hanging clip; commercial quality, extruded aluminum, factory-finished in factory-applied baked polyester paint.
3. Axiom Outside Corner Posts (Straight Only): Commercial quality extruded aluminum sections formed to match the Axiom trim channel profile; pre-assembled with built-in splice plates that connect to straight Axiom sections; 7/8 inch x 7/8 inch X 4-inch; factory-finished in factory-applied baked polyester paint.

4. Axiom Inside Corners (Straight Only): Commercial quality extruded aluminum sections formed to match the Axiom trim channel profile that connect to straight Axiom sections, 12 inch x 3/4 inch x 4-inch factory-finished in factory-applied baked polyester.
5. Accessories:
   a. AXHGC - Hanging clip, commercial quality aluminum, unfinished, used to align grid members that extend beyond the lower edge of the trim.
   b. AX2HGC - Hanging clip, commercial quality aluminum, unfinished, used when suspension wires must be attached directly to the trim sections.
   c. AXSPLICE - Splice with set screws, galvanized steel, unfinished, used to attached factory-mitered inside corners
   d. AX4SPLICE - Splice with set screws, galvanized steel, unfinished, used to attach joints between sections of trim.
   e. AXTBC - T-bar Connector Clip, commercial grade aluminum, unfinished, used to attach channel trim to supporting suspension members.
   f. AXSPTHDC – Perimeter Trim Hold Down Clip used to secure cut edges of metal panels at the Axiom trim.
   g. AXBTSTR – Drywall Bottom Trim Straight, extruded aluminum, 120 inches x 1-9/64 inch x 27/32 inch, used to finish edges of 5/8 inch drywall that is applied to the bottom surface of the Axiom.
   h. AXBTCUR – Drywall Bottom Trim Curved, extruded aluminum, 120 inches x 1-9/64 inch x 27/32 inch, used to finish edges of 5/8 inch drywall that is applied to the bottom surface of the Axiom.
6. Manufacturer’s standard finish, as specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.

2.12 ACCESSORIES – ACT 2

A. Fiberglass Infill Panel:
   1. Item No. 8200100.
   2. Dimensions: 24 inches by 24 inches by 1 inch.
   3. Color: Black.

2.13 ACCESS IDENTIFICATION

A. Use colored markers with pressure sensitive adhesive on one side.
B. Make colored markers of paper of plastic, 6 to 9 mm (1/4 to 3/8 inch) in diameter.
C. Use markers of the same diameter throughout building.
D. Color Code: Use following color markers for service identification:

Color	Service
Red	Sprinkler System: Valves and Controls

Green.....Domestic Water: Valves and Controls
Yellow.....Chilled Water and Heating Water
Orange.....Ductwork: Fire Dampers
Blue.....Ductwork: Dampers and Controls
Black.....Gas: Laboratory, Medical, Air and Vacuum

PART 3 - EXECUTION

3.1 CEILING TREATMENT

A. Treatment of ceilings shall include sides and soffits of ceiling beams, furred work 600 mm (24 inches) wide and over, and vertical surfaces at changes in ceiling heights unless otherwise shown. Install acoustic tiles after wet finishes have been installed and solvents have cured.
B. Lay out acoustical units symmetrically about center lines of each room or space unless shown otherwise on reflected ceiling plan.
C. Moldings:
   1. Install metal wall molding at perimeter of room, column, or edge at vertical surfaces.
   2. Install special shaped molding at changes in ceiling heights and at other breaks in ceiling construction to support acoustical units and to conceal their edges.
D. Perimeter Seal:
   1. Install perimeter seal between vertical leg of wall molding and finish wall, partition, and other vertical surfaces.
   2. Install perimeter seal to finish flush with exposed faces of horizontal legs of wall molding.
E. Fire-Rated System:
   1. Total assembly, consisting of the ceiling suspension system, acoustical units, penetrations, structural components and floor or roof construction above, shall have a 1 hour fire rating based on tests conducted in conformance with ASTM E119.
   2. Provide concealed fire protection around penetrations in ceilings for electric and mechanical work, and other penetrations as required to maintain the integrity of the fire-rated assembly.
   3. Install fire rated ceiling systems to conform to tested assembly.

3.2 CEILING SUSPENSION SYSTEM INSTALLATION

A. General:
   1. Install metal suspension system for acoustical tile and lay-in panels in accordance with ASTM C636, except as specified otherwise.
   2. Use direct or indirect hung suspension system or combination thereof as defined in ASTM C635.
   3. Support a maximum area of 1.48 m^2 (16 sf) of ceiling per hanger.

4. Prevent deflection in excess of 1/360 of span of cross runner and main runner.
5. Provide extra hangers, minimum of one hanger at each corner of each item of mechanical, electrical and miscellaneous equipment supported by ceiling suspension system not having separate support or hangers.
6. Provide not less than 100 mm (4 inch) clearance from the exposed face of the acoustical units to the underside of ducts, pipe, conduit, secondary suspension channels, concrete beams or joists; and steel beam or bar joist unless furred system is shown,
7. Use main runners not less than 1200 mm (48 inches) in length.
8. Install hanger wires vertically. Angled wires are not acceptable except for seismic restraint bracing wires.

B. Anchorage to Structure:
   1. Concrete:
      a. Install hanger inserts and wire loops required for support of hanger and bracing wire in concrete forms before concrete is placed. Install hanger wires with looped ends through steel deck if steel deck does not have attachment device.
      b. Use eye pins or threaded studs with screw-on eyes in existing or already placed concrete structures to support hanger and bracing wire. Install in sides of concrete beams or joists at mid height.
   2. Steel:
      a. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels for attachment of hanger wires.
         (1) Size and space carrying channels to insure that the maximum deflection specified will not be exceeded.
         (2) Attach hangers to steel carrying channels, spaced four feet on center, unless area supported or deflection exceeds the amount specified.
      b. Attach carrying channels to the bottom flange of steel beams spaced not 1200 mm (4 feet) on center before fire proofing is installed. Weld or use steel clips to attach to beam to develop full strength of carrying channel.
      c. Attach hangers to bottom chord of bar joists or to carrying channels installed between the bar joists when hanger spacing prevents anchorage to joist. Rest carrying channels on top of the bottom chord of the bar joists, and securely wire tie or clip to joist.

C. Direct Hung Suspension System:
   1. As illustrated in ASTM C635.

2. Support main runners by hanger wires attached directly to the structure overhead.
3. Maximum spacing of hangers, 1200 mm (4 feet) on centers unless interference occurs by mechanical systems. Use indirect hung suspension system where not possible to maintain hanger spacing.

D. Indirect Hung Suspension System:
1. As illustrated in ASTM C635.
2. Space carrying channels for indirect hung suspension system not more than 1200 mm (4 feet) on center. Space hangers for carrying channels not more than 2400 mm (8 feet) on center or for carrying channels less than 1200 mm (4 feet) or center so as to insure that specified requirements are not exceeded.
3. Support main runners by specially designed clips attached to carrying channels.

E. Ceiling Bracing System:
1. Construct system is accordance with ASTM E580.
2. Connect bracing wires to structure above as specified for anchorage to structure and to main runner or carrying channels of suspended ceiling at bottom.

3.3 ACOUSTICAL UNIT INSTALLATION

A. Cut acoustic units for perimeter borders and penetrations to fit tight against penetration for joint not concealed by molding.
B. Install lay-in acoustic panels in exposed grid with not less than 6 mm (1/4 inch) bearing at edges on supports.
1. Install tile to lay level and in full contact with exposed grid.
2. Replace cracked, broken, stained, dirty, or tile not cut for minimum bearing.

C. Tile in concealed grid upward access suspension system:
1. Install acoustical tile with joints close, straight and true to line, and with exposed surfaces level and flush at joints.
2. Make corners and arises full, and without worn or broken places.
3. Locate acoustical units providing access as specified under Article, ACCESS.

D. Adhesive applied tile:
1. Condition of surface shall be in accordance with ASTM D1779, Note 1, Cleanliness of Surface, and Note 4, Rigidity of Base Surface.
2. Size or seal surface as recommended by manufacturer of adhesive and allow to dry before installing units.

E. Markers:
1. Install markers of color code specified to identify the various concealed piping, mechanical, and plumbing systems.

2. Attach colored markers to exposed grid on opposite sides of the units providing access.
3. Attach marker on exposed ceiling surface of upward access acoustical unit.

3.4 CLEAN-UP AND COMPLETION

A. Replace damaged, discolored, dirty, cracked and broken acoustical units.

B. Leave finished work free from defects.

- - - E N D - - -

SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the installation of rubber cove base, stair treads and rubber floor tile on landings.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS for additional LEED requirements.
B. Section 01 81 19, INDOOR AIR QUALITY REQUIREMENTS for VOC limit.
C. Color and texture: Section 09 06 00, SCHEDULE FOR FINISHESS.
D. Linoleum flooring: Section 09 65 16.13, LINOLEUM FLOORING.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Manufacturer's Literature and Data:
   1. Description of each product.
   2. Base and stair material manufacturer's recommendations for adhesives.
   3. Application and installation instructions.
C. Samples:
   1. Base: 150 mm (6 inches) long, each type and color.
   2. Stair Treads: 150 mm (6 inches) long.
   3. Floor Tile: 300 mm (12 inches) square.
   4. Adhesive: Literature indicating each type.
D. LEED Submittals:
   1. Credits MR 4.1 & 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.
      a. Include statement indicating costs for each product containing recycled content.
   2. Credits MR 5.1 & 5.2: For products manufactured within 500 miles of project site *and* whose raw materials are extracted, harvested or recovered, within 500 miles of the project site, documentation indicating the location and distance of material manufacturer and point of extraction, harvest, or recovery for each raw material from the Project site.
      a. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

3. Credit EQ 4.1: Manufacturer’s product data for installation adhesives and sealants applied on site and within the vapor barrier, including printed statement of VOC content (in g/L).
4. Credit EQ 4.3:
   a. Manufacturer’s product data for carpet tile, including statement of compliance with CRI Green Label Plus testing and requirements.
   b. Manufacturer’s product data for carpet cushion including statement of compliance with CRI Green Label testing and requirements.
   c. Manufacturer’s product data for installation adhesive, including printed statement of VOC content (in g/L).

1.4 DELIVERY

A. Deliver materials to the site in original sealed packages or containers, clearly marked with the manufacturer's name or brand, type and color, production run number and date of manufacture.
B. Materials from containers which have been distorted, damaged or opened prior to installation will be rejected.

1.5 STORAGE

A. Store materials in weather tight and dry storage facility.
B. Protect material from damage by handling and construction operations before, during, and after installation.

1.6 APPLICABLE PUBLICATIONS

A. The publication listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
B. American Society for Testing and Materials (ASTM):
   F1344-04.....Rubber Floor Tile
   F1859-04.....Rubber Sheet Floor Covering without Backing
   F1860-04.....Rubber Sheet Floor Covering with Backing
   F1861-02.....Resilient Wall Base
C. Federal Specifications (Fed. Spec.):
   RR-T-650E.....Treads, Metallic and Non-Metallic, Nonskid

PART 2 - PRODUCTS

2.1 GENERAL

A. Use only products by the same manufacturer and from the same production run.
B. LEED Requirements:
   1. Recycled Content of Steel Products: Provide steel products with minimum 25% post-consumer recycled content.

2. For installation adhesives, sealants, paints, and coatings applied on site and within the vapor barrier, comply with VOC limits outlined in Division 01 Section "Indoor Air Quality Requirements."
3. Provide carpet that complies with CRI Green Label Plus testing and requirements.
   Provide carpet cushion that complies CRI Green Label testing and requirements.

2.2 RESILIENT BASE

A. ASTM F1861, 3 mm (1/8 inch) thick, 100 mm (4 inches) high, Type TP Rubber, Thermoplastics, Group 2-layered with molded top. Style B-cove.
B. Where carpet occurs, use Style A-straight.
C. Use only one type of base throughout.

2.3 RESILIENT TREADS

A. Fed. Spec. RR-T-650, Composition A, Type 2, 5 mm (3/16 inch) thick on wear surface tapering to 3 mm (1/8 inch) thick at riser end.
B. Nosing shape to conform to sub-tread nosing shape.

2.4 RUBBER FLOOR TILE

A. ASTM F1344, F1859 or F1860, 3 mm (1/8 inch) thick, material by the same manufacturer as the rubber treads, color and pattern to match treads.
B. Use for stair landings.
C. Use rubber floor tile made with a minimum of 90% consumer rubber where possible.

2.5 PRIMER (FOR CONCRETE FLOORS)

A. As recommended by the adhesive and tile manufacturer.

2.6 LEVELING COMPOUND (FOR CONCRETE FLOORS)

A. Provide products with latex or polyvinyl acetate resins in the mix.

2.7 ADHESIVES

A. Use products recommended by the material manufacturer for the conditions of use.
B. Use low-VOC adhesive during installation. Water based adhesive with low VOC is preferred over solvent based adhesive.

PART 3 - EXECUTION

3.1 PROJECT CONDITIONS

A. Maintain temperature of materials above 21° C (70 °F), for 48 hours before installation.
B. Maintain temperature of rooms where work occurs, between 21° C and 27° C (70°F and 80°F) for at least 48 hours, before, during, and after installation.
C. Do not install materials until building is permanently enclosed and wet construction is complete, dry, and cured.

3.2 INSTALLATION REQUIREMENTS

A. The respective manufacturer's instructions for application and installation will be considered for use when approved by the Resident Engineer.

B. Submit proposed installation deviation from this specification to the Resident Engineer indicating the differences in the method of installation.

C. The Resident Engineer reserves the right to have test portions of material installation removed to check for non-uniform adhesion and spotty adhesive coverage.

3.3 PREPARATION

A. Examine surfaces on which material is to be installed.

B. Fill cracks, pits, and dents with leveling compound.

C. Level to 3 mm (1/8 inch) maximum variations.

D. Do not use adhesive for leveling or filling.

E. Grind, sand, or cut away protrusions; grind high spots.

F. Clean substrate area of oil, grease, dust, paint, and deleterious substances.

G. Substrate area dry and cured. Perform manufacturer’s recommended bond and moisture test.

H. Preparation of existing installation:

1. Remove existing base and stair treads including adhesive.
2. Do not use solvents to remove adhesives.
3. Prepare substrate as specified.

3.4 BASE INSTALLATION

A. Location:

1. Unless otherwise specified or shown, where base is scheduled, install base over toe space of base of casework, lockers, laboratory, pharmacy furniture island cabinets and where other equipment occurs.
2. Extend base scheduled for room into adjacent closet, alcoves, and around columns.

B. Application:

1. Apply adhesive uniformly with no bare spots.
2. Set base with joints aligned and butted to touch for entire height.
3. Before starting installation, layout base material to provide the minimum number of joints with no strip less than 600 mm (24 inches) length.
   a. Short pieces to save material will not be permitted.
   b. Locate joints as remote from corners as the material lengths or the wall configuration will permit.

C. Form corners and end stops as follows:

1. Score back of outside corner.
2. Score face of inside corner and notch cove.

D. Roll base for complete adhesion.

3.5 STAIR TREAD INSTALLATION

A. Prepare surfaces to receive the treads in accordance with applicable portions of paragraph, preparation.

B. Layout of Treads.
1. No joints will be accepted in treads.
2. Set full treads on intermediate and floor landings.

C. Application:
1. Apply adhesive uniformly with no bare spots.
2. Roll and pound treads to assure adhesion.

3.6 RUBBER FLOOR TILE INSTALLATION.

A. Prepare surfaces to receive rubber floor tile in accordance with applicable portions of paragraph, preparation.

B. Install rubber tile on floors and intermediate landings where resilient stair treads are installed; center joint with other flooring material under doors.

C. Application:
1. Apply adhesive uniformly with no bare spots.
2. Roll rubber to assure adhesion.

3.7 CLEANING AND PROTECTION

A. Clean all exposed surfaces of base and adjoining areas of adhesive spatter before it sets.

B. Keep traffic off resilient material for at least 72 hours after installation.

C. Clean and polish materials in the following order:
1. After two weeks, scrub resilient base, sheet rubber and treads materials with a minimum amount of water and a mild detergent. Leave surfaces clean and free of detergent residue. Polish resilient base to a gloss finish.
2. Do not polish tread and sheet rubber materials.

D. When construction traffic is anticipated, cover tread materials with reinforced kraft paper and plywood or hardboard properly secured and maintained until removal is directed by the Resident Engineer.

E. Where protective materials are removed and immediately prior to acceptance, replace damaged materials and re-clean resilient materials. Damaged materials are defined as having cuts, gouges, scrapes or tears and not fully adhered.

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SECTION 09 65 16.13
LINOLEUM FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section Includes:

1. Linoleum floor tile and sheet flooring.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS for additional LEED requirements.

B. Section 01 81 19, INDOOR AIR QUALITY REQUIREMENTS for VOC limit.

C. Section 09 65 13, RESILIENT BASE AND ACCESSORIES for resilient base, reducer strips, and other accessories installed with linoleum floor covering

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Credits MR 4.1 & 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.

a. Include statement indicating costs for each product containing recycled content.

2. Credit EQ 4.1: Manufacturer’s product data for installation adhesives and sealants applied on site and within the vapor barrier, including printed statement of VOC content (in g/L).

C. Shop Drawings: For each type of floor covering. Include floor covering layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.

D. Samples for Initial Selection: For each type of floor covering indicated.

1. Include similar Samples of installation accessories involving color selection.

E. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch (152-by-230-mm) sections of each color and pattern of floor covering required.

1. Heat-Welding Bead: Include manufacturer's standard-size Samples, but not less than 9 inches (230 mm) long, of each color required.

F. Heat-Welded Seam Samples: For each floor covering product and welding bead color and pattern combination required; with seam running lengthwise and in center of 6-by-9-inch (152-by-230-mm) Sample applied to rigid backing and prepared by Installer for this Project.

G. Product Schedule: For floor covering. Use same designations indicated on Drawings.

H. Qualification Data: For qualified Installer.

I. Maintenance Data: For each type of floor covering to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor covering installation.

1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.

B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

C. Performance Requirements:

1. Floor Tile:

Property	ASTM Test	Results
Static Load Limit	ASTM F 970	1500 psi
Slip resistance-flat surfaces	ASTM D 2047	0.6

2. Sheet Flooring:

Property	ASTM Test	Results
Static Load Limit	ASTM F 970	450 psi
Slip resistance-flat surfaces	ASTM D 2047	0.6

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store floor coverings and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 65 deg F (18 deg C) or more than 90 deg F (32 deg C).
   1. Floor Tile: Store on flat surfaces.
   2. Sheet Flooring: Store rolls upright.

1.6 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor coverings during the following time periods:
   1. 72 hours before installation.
   2. During installation.
   3. 72 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 72 hours after floor covering installation.

E. Install floor coverings after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-Of-Design Products: Subject to compliance with requirements, provide Forbo Flooring, Inc. or comparable product from one of the following:
   1. Armstrong World Industries, Inc.
   2. Tarkett Inc.

B. LEED Requirements:
   1. Recycled Content of Steel Products: Provide steel products with minimum 25% post-consumer recycled content.
   2. Provide installation adhesives, sealants, paints, and coatings applied on site and within the vapor barrier, that comply with VOC limits outlined in Division 01 Section "Indoor Air Quality Requirements."

2.2 LINOLEUM FLOOR COVERING

A. Floor Tile: ASTM F 2195, Type I, linoleum floor tile with fibrous backing, Marmoleum (MCT).

1. Nominal Floor Tile Size: 13 by 13 inches (325 by 325 mm).
2. Thickness: 0.08 inch (2.0 mm).

B. Sheet Flooring: ASTM F 2034, Type I, linoleum sheet with backing, Marmoleum.
1. Roll Size: In manufacturer's standard length by not less than 79 inches (2005 mm) wide.
2. Thickness: 0.10 inch (2.5 mm).

C. Seaming Method: Heat welded.

D. Colors and Patterns: Refer to Section 09 06 00, SCHEDULE OF FINISHES.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit products and substrate conditions indicated.
1. Use adhesives that have a VOC content of not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Heat-Welding Bead: Solid-strand product of linoleum floor covering manufacturer.

D. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor coverings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor coverings.

B. Concrete Substrates: Prepare according to ASTM F 710.
1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with floor covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
   a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
   b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor coverings until they are same temperature as space where they are to be installed.
   1. Move floor coverings and installation materials into spaces where they will be installed at least 72 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.3 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions for installing floor coverings.

B. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

C. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.

D. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on subfloor. Use chalk or other nonpermanent marking device.

E. Install floor coverings on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of floor covering installed on covers and adjoining floor covering. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.

F. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

G. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.

3.4 LINOLEUM FLOOR TILE INSTALLATION

A. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay floor tiles in pattern indicated.

B. Match floor tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.

1. Lay floor tiles in pattern of colors and sizes indicated.

3.5 LINOLEUM SHEET FLOORING INSTALLATION

A. Unroll sheet floorings and allow them to stabilize before cutting and fitting.

B. Lay out sheet floorings as follows:

1. Maintain uniformity of floor covering direction.
2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in floor covering substrates.
3. Match edges of floor coverings for color shading at seams.
4. Avoid cross seams.
5. Eliminate deformations that result from hanging method used during drying process (stove bar marks).

3.6 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor coverings.

B. Perform the following operations immediately after completing floor covering installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.
C. Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor coverings before applying liquid floor polish.
   1. Apply manufacturer's recommended coats.
E. After allowing drying room film (yellow film caused by linseed oil oxidation) to disappear, cover floor coverings until Substantial Completion.

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SECTION 09 66 23
RESINOUS MATRIX TERRAZZO FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section Includes:

1. Thin-set epoxy-resin terrazzo flooring.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS for additional LEED requirements.

B. Section 01 81 19, INDOOR AIR QUALITY REQUIREMENTS for VOC limit.

C. Section 07 92 00, JOINT SEALANTS for sealants installed with terrazzo.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Product Data for Credit MR 4.1 and Credit MR 4.2: For marble chips, aggregates, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement that indicates cost for each product having recycled content.
2. Credit EQ 4.1: Manufacturer’s product data for installation adhesives and sealants applied on site and within the vapor barrier, including printed statement of VOC content (in g/L).

C. Shop Drawings: Include terrazzo installation requirements. Include plans, elevations, sections, component details, and attachments to other work. Show layout of the following:

1. Divider and decorative strips.
2. Control-joint strips.
3. Accessory strips.
4. Abrasive strips.
5. Precast terrazzo jointing and edge configurations, including anchorage details.
6. Terrazzo patterns.

D. Samples for Initial Selection: Manufacturer's color plates showing the full range of colors and patterns available for each terrazzo type indicated.

E. Samples for Verification: For each type, material, color, and pattern of terrazzo and accessory required showing the full range of color, texture, and pattern variations expected. Label each terrazzo sample

to identify manufacturer's matrix color and aggregate types, sizes, and proportions. Prepare samples of same thickness and from same material to be used for the Work in size indicated below:

1. Terrazzo: 6-inch- (150-mm-) square Samples.
2. Precast Terrazzo: 6-inch- (150-mm-) square Samples.
3. Accessories: 6-inch- (150-mm-) long Samples of each exposed strip item required.

F. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

G. Qualification Data: For qualified Installer.

H. Material Certificates: For each type of terrazzo material or product, from manufacturer.

I. Maintenance Data: For terrazzo to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who is acceptable to terrazzo manufacturer to install manufacturer's products.

1. Engage an installer who is certified in writing by terrazzo manufacturer as qualified to install manufacturer's products.
2. Engage an installer who is a contractor member of NTMA.

B. Source Limitations: Obtain primary terrazzo materials from one source from a single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.

C. Source Limitations for Aggregates: Obtain each color, grade, type, and variety of granular materials from one source with resources to provide materials of consistent quality in appearance and physical properties.

D. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups for terrazzo including accessories.
   a. Size: Minimum 100 sq. ft. (9 sq. m) of typical poured-in-place flooring and base condition for each color and pattern in locations directed by Architect.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to terrazzo including, but not limited to, the following:
      a. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
      b. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
      c. Review special terrazzo designs and patterns.
      d. Review dust-control procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number if any.

B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting terrazzo installation.

B. Field Measurements: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.

C. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.

D. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.

E. Control and collect dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.
   1. Provide dustproof partitions and temporary enclosures to limit dust migration and to isolate areas from noise.

PART 2 - PRODUCTS

2.1 EPOXY-RESIN TERRAZZO

A. Basis-of-Design Product: Subject to compliance with requirements, provide Terrazzo & Marble Supply Companies; Terroxy Resin Systems or comparable from one of the following:

1. Crossfield Products Corp., Dex-O-Tex Division.
2. General Polymers Corporation.
3. Master Terrazzo Technologies LLC.
4. TEC Specialty Construction Brands, Inc.; Tuff-Lite Epoxy Terrazzo.

B. LEED Requirements:
1. Provide installation adhesives, sealants, paints, and coatings applied on site and within the vapor barrier, that comply with VOC limits outlined in Division 01 Section "Indoor Air Quality Requirements."

C. Materials:
1. Flexible Reinforcing Membrane: Manufacturer's resinous membrane for substrate crack preparation and reflective crack reduction.
   a. Reinforcement: Fiberglass scrim.
2. Primer: Manufacturer's product recommended for substrate and use indicated.
3. Epoxy-Resin Matrix: Manufacturer's standard recommended for use indicated and in color required for mix indicated.
   a. Physical Properties without Aggregate:
      1) Hardness: 60 to 85 per ASTM D 2240, Shore D.
      2) Minimum Tensile Strength: 3000 psi (20.7 MPa) per ASTM D 638 for a 2-inch (51-mm) specimen made using a "C" die per ASTM D 412.
      3) Minimum Compressive Strength: 10,000 psi (6.9 MPa) per ASTM D 695, Specimen B cylinder.
      4) Chemical Resistance: No deleterious effects by contaminants listed below after seven-day immersion at room temperature per ASTM D 1308.
         a) Distilled water.
         b) Mineral water.
         c) Isopropanol.
         d) Ethanol.
         e) 0.025 percent detergent solution.
         f) 1.0 percent soap solution.
         g) 10 percent sodium hydroxide.
         h) 10 percent hydrochloric acid.
         i) 30 percent sulfuric acid.
         j) 5 percent acetic acid.

b. Physical Properties with Aggregates: For resin blended with Georgia white marble, ground, grouted, and cured per requirements in NTMA's "Terrazzo Specifications and Design Guide," comply with the following:
   1) Flammability: Self-extinguishing, maximum extent of burning 0.25 inch (6.35 mm) per ASTM D 635.
   2) Thermal Coefficient of Linear Expansion: 0.0025 inch/inch per deg F (0.0025 mm/mm per 0.5556 deg C) for temperature range of minus 12 to plus 140 deg F (minus 24 to plus 60 deg C) per ASTM D 696.

4. Aggregates: Complying with NTMA gradation standards for mix indicated and containing no deleterious or foreign matter.
   a. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C 131.
   b. 24-Hour Absorption Rate: Less than 0.75 percent.
   c. Dust Content: Less than 1.0 percent by weight.
5. Finishing Grout: Resin based.

D. Terrazzo: Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's written instructions for matrix and aggregate proportions and mixing.
   1. Formulated Mix Color and Pattern: As selected by Architect from manufacturer's full range and from NTMA standard-terrazzo plates.

2.2 STRIP MATERIALS

A. Thin-Set Divider Strips: L-type angle or T-type, 1/4 inch (6.4 mm) deep.
   1. Material: Aluminum, 16 gage, minimum.
   2. Top Width: 1/8 inch (3.2 mm) and 1/4 inch (6.4 mm) as indicated on Drawings and as selected by Architect.
   3. Divider strips for decorative effects:
      a. Terrazo divider strips to create a border for each color of each floor design.

B. Control-Joint Strips: Separate, double L-type angles, positioned back to back, that match material, thickness, and color of divider strips and in depth required for topping thickness indicated.

C. Accessory Strips: Match divider strip width, material, and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:
   1. Base-bead strips for exposed top edge of terrazzo base.

2. Edge-bead strips for exposed edges of terrazzo.

2.3 MISCELLANEOUS ACCESSORIES

A. Strip Adhesive: Epoxy-resin adhesive recommended by adhesive manufacturer for this use and acceptable to terrazzo manufacturer.
   1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Anchoring Devices:
   1. Strips: Provide mechanical anchoring devices for strip materials as required for secure attachment to substrate.
   2. Precast Terrazzo: Provide mechanical anchoring devices as recommended by fabricator for proper anchorage and support of units for conditions of installation and support.

C. Patching and Fill Material: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.

D. Joint Compound: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.

E. Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by sealer manufacturer for use on terrazzo type indicated.

F. Sealer: Slip- and stain-resistant penetrating-type sealer that is chemically neutral with pH factor between 7 and 10; does not affect color or physical properties of terrazzo; is recommended by sealer manufacturer; and complies with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo type indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions, including levelness tolerances, have been corrected.

3.2 PREPARATION

A. Clean substrates of substances, including oil, grease, and curing compounds, that might impair terrazzo bond. Provide clean, dry, and neutral substrate for terrazzo application.

B. Concrete Slabs:

1. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with terrazzo.
   a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
   b. Repair damaged and deteriorated concrete according to terrazzo manufacturer's written recommendations.
   c. Use patching and fill material to fill holes and depressions in substrates according to terrazzo manufacturer's written instructions.
2. Verify that concrete substrates are visibly dry and free of moisture.
3. Moisture Testing:
   a. Test for moisture by anhydrous calcium chloride method according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
   b. Test for moisture by relative humidity probe and digital meter method according to ASTM F 2170. Proceed with installation only after substrates have a maximum relative-humidity-measurement reading of 70 to 75 percent in 24 hours.
   c. Test for moisture content by method recommended in writing by terrazzo manufacturer. Proceed with installation only after substrates pass testing.

C. Protect other work from dust generated by grinding operations. Control dust to prevent air pollution and comply with environmental protection regulations.
   1. Erect and maintain temporary enclosures and other suitable methods to limit dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

D. Installation of terrazzo indicates acceptance of surfaces and conditions.

3.3 EPOXY-RESIN TERRAZZO INSTALLATION

A. General:
   1. Comply with NTMA's written recommendations for terrazzo and accessory installation.

2. Place, rough grind, grout, cure grout, fine grind, and finish terrazzo according to manufacturer's written instructions and NTMA's "Terrazzo Specifications and Design Guide."
3. Installation Tolerance: Limit variation in terrazzo surface from level to 1/4 inch in 10 feet (6 mm in 3 m); noncumulative.
4. Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.
5. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.

B. Thickness: 3/8 inch (9.5 mm) nominal finished floor thickness, unless otherwise indicated on Drawings.

C. Flexible Reinforcing Membrane:
1. Prepare and prefill substrate cracks with membrane material.
2. Install membrane to produce full substrate coverage in areas to receive terrazzo.
3. Reinforce membrane with fiberglass scrim.
4. Prepare membrane according to manufacturer's written instructions before applying substrate primer.

D. Primer: Apply to terrazzo substrates according to manufacturer's written instructions.

E. Strip Materials:
1. Divider and Control-Joint Strips:
a. Locate divider strips in locations indicated.
b. Install divider strips and control joint strips 20 by 20 feet or less on centers.
c. Install control-joint strips back to back directly above concrete-slab control joints.
d. Install control-joint strips with 1/4-inch (6.4-mm) gap between strips, and install sealant in gap.
e. Install strips in adhesive setting bed without voids below strips, or mechanically anchor strips as required to attach strips to substrate, as recommended by strip manufacturer.
2. Accessory Strips: Install accessory strips as required to provide a complete installation.

F. Rough Grinding: Grind with 24 or finer grit stones or with comparable diamond plates. Follow initial grind with 80 grid stones.

G. Grouting: Clean terrazzo with clean water and rinse. Remove excess rinse water and hand apply grout using identical color as used in topping, taking care to fill voids.

H. Cure Grout: Cure grout in accordance with manufacturer’s instructions.
   1. Grout may be left on terrazzo until all heavy and messy work in Project areas with terrazzo have been completed.

I. Fine Grinding: Grind with stones 120 grit or finer until all grout is removed from surface. Repeat rough grinding, grout coat, and fine grinding if large voids exist after initial fine grinding. Produce surface with a minimum of 70 percent aggregate exposure.

J. Repair: Remove and replace terrazzo areas that evidence lack of bond with substrate. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Resident Engineer and Architect.

3.4 FIELD QUALITY CONTROL

A. The right is reserved to invoke the following material testing procedure at any time, and any number of times during that period of flooring application:
   1. Engage the services of an independent testing laboratory to sample materials being used. Samples of material will be taken, identified and sealed, and certified in presence of Resident Engineer, Architect and the Contractor.
   2. Testing laboratory will perform tests for any of characteristics specified, using applicable testing procedures referenced herein, or if not referenced, in manufacturer’s product data.

B. If test results show materials being used do not comply with specified requirements, Contractor may be directed by Resident Engineer and Architect to stop work, and remove non-complying materials; pay for testing; and reapply flooring materials to surfaces coated with rejected materials.

3.5 CLEANING AND PROTECTION

A. Cleaning:
   1. Remove grinding dust from installation and adjacent areas.
   2. Wash surfaces with cleaner according to NTMA's written recommendations and manufacturer's written instructions; rinse surfaces with water and allow to dry thoroughly.

B. Sealing:

1. Seal surfaces according to NTMA's written recommendations.
2. Apply sealer according to sealer manufacturer's written instructions.

C. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

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SECTION 09 66 43
ENGINEERED QUARTZ STONE FLOOR TILE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Engineered quartz stone floor tile for installation over concrete floors.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS for additional LEED requirements.
B. Section 01 81 19, INDOOR AIR QUALITY REQUIREMENTS for VOC limit.
C. Resilient Base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.
D. Concrete floors: Section 03 30 00, CAST-IN-PLACE CONCRETE.
E. Color and Pattern: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 MANUFACTURER'S QUALIFICATIONS

A. Approval by Contracting Officer is required of products or service, or proposed manufacturer, suppliers and installers, and will be based upon submission by Contractor of certification that:
   1. Manufacturer regularly and presently manufactures engineered quartz stone floor tile as one of its principal products.
   2. Installer has technical qualifications, experience, trained personnel and facilities to install specified items. Approval will not be given, however, where experience record is one of unsatisfactory performance.
   3. Manufacturer's product submitted has been in satisfactory and efficient operation on three installations similar or equivalent to this project for three years. Submit list of installations. List shall include name of project, and facility owner and location of project.

1.4 SUBMITTALS

A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:
B. Flooring Manufacturer's Literature and Data: Printed installation instructions for conditions indicated.
C. Certificates: Indicating materials conform to specified requirements. Indicating flooring manufacturer's approval of underlayment, adhesive and cleaners.
D. Samples: Engineered quartz stone floor tile (each color and pattern to be used), each color, 300 mm (12 inch) square tiles.
E. LEED Submittals:

Credit EQ 4.1: Manufacturer’s product data for installation adhesives and sealants applied on site and within the vapor barrier, including printed statement of VOC content (in g/L).

1.5 DELIVERY

A. Deliver materials to job in manufacturer's original unopened containers, free of damage, with manufacturer's brand name marked thereon.

1.6 STORAGE

A. Store materials in a protected area. Storage area shall be kept dry and temperature of storage area shall not be lower than 10 degrees C (50 degrees F) or higher than 32 degrees C (90 degrees F).

1.7 PROJECT CONDITIONS

A. Tiles shall not be installed until all other work that could cause damage to the finish flooring has been completed. Maintain a temperature of not less than 21 degrees C (70 degrees F) in spaces where tile is to be installed for at least 48 hours before, during and after the laying of tiles. Bring tile into such spaces and allow it to condition at not less than 21 degrees C (70 degrees F) at least 48 hours before installing. A minimum temperature of 13 degrees C (55 degrees F) shall be maintained thereafter.

1.8 WARRANTY

A. Engineered quartz stone floor tile is subject to terms of "Warranty of Construction" FAR clause 52.246-21, except that warranty period is two years in lieu of one year.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Basis-Of-Design Product: Subject to compliance with requirements, provide Innovative Stone; Quartz Based Retro 2000 or approved equivalent.

B. LEED Requirements:

1. Provide installation adhesives, sealants, paints, and coatings applied on site and within the vapor barrier, that comply with VOC limits outlined in Division 01 Section "Indoor Air Quality Requirements.”

2.2 ENGINEERED QUARTZ STONE FLOOR TILE

A. Engineered quartz stone floor tile shall consist of:

1. The Quart aggregates shall be accurately graded in accordance with manufacturer’s standards of production.
2. The aggregates shall be bound with white portland cement 5.25 class I, polymeric latexes and small amounts of water.

3. Use metal oxide colorants that will provide uniform color through the product that will not fade.
4. Vibrate in a vacuum chamber to eliminate voids and achieve a bulk specific gravity of 2.3.
5. Allow adequate cure time prior to finishing.
6. Grind all products to the exact thickness called for.
7. Grind and finish all edges to provide exact size called for within one-tenth of 1 percent. Chamfer edges to prevent chipping.

B. Tiles shall be 10 mm (3/8-inch) thick, unless otherwise indicated, and nominal 300 x 300 mm (12 inches by 12 inches) square. Tiles shall have a smooth polished finish with uniform color distribution of chips.

C. Tile shall have the following properties:

PROPERTY	TEST METHOD	VALUE
Water Absorption by weight in percent	ASTM C97	0.055
Abrasion resistance of stone Subjected to foot traffic	ASTM C241	48
Scratch Resistance	MOH'S Hardness	5
Slip Resistance (Static Coefficient of Friction of ceramic tile and other surfaces)	ASTM C1028	Polished Dry (Neolite) 0.85 to 1.06 Wet (Neolite) 0.56 to 0.61 Honed Dry (Neolite) 0.75 to 0.87 Wet (Neolite) 0.55 to 0.58

D. Color: Refer to Section 09 06 00, SCHEDULE FOR FINISHES.

2.3 ADHESIVE

A. Engineered quartz stone floor tile manufacturer's standard product or a product recommended by the engineered quartz stone floor tile manufacturer.

2.4 WALL BASE

A. See Section 09 65 13, RESILIENT BASE AND ACCESSORIES.

2.5 METAL EDGE STRIPS

A. Extruded aluminum, butt-type, approximately 38 mm (1-1/2 inches) wide with thickness to set top surface flush with top of tile and with bevel at exposed edge. Edge strips shall have countersunk holes, near each end and spaced at no more than 300 mm (8 inches) on center for securement.

PART 3 - EXECUTION

3.1 GENERAL

A. Provide flooring on floor surfaces where shown on the drawings. Provide resilient base as scheduled for room or space, for freestanding columns, pilasters, furred spaces convectors and where shown. Resilient base required over metal base of casework is specified in other sections. Except as necessary to install new tile, keep all traffic off new tile for at least 24 hours after installation.

3.2 SUBSTRATE PREPARATION

A. Concrete Floors (New Construction): Fill holes and cracks with approved mortar. Concrete floors shall be free of curing compounds, grease, dirt, loose particles and other foreign matter that would prevent adhesion. Remove projecting irregularities by chipping or grinding smooth. Fill depressions and level uneven surfaces with underlayment. Then rinse subfloors and allow them to dry thoroughly before applying adhesive.

3.3 MOISTURE TEST

A. After concrete floor surfaces have been cleaned, spread small patches of adhesive to be used, in several locations in each room and allow to dry overnight. If the adhesive can be peeled easily from the floor surfaces, the floor is not sufficiently dry. The test shall be repeated until the adhesive adheres properly. Lay tile flooring when the adhesive adheres tightly to the subfloor.

3.4 INSTALLATION

A. Install tile in accordance with the tile manufacturer's approved installation instructions, except as specified herein. Lay design symmetrical about center lines of rooms. Joints shall be tight, and inconspicuous as possible, and in true alignment. Cut tile to fit snugly at pipes and other fixed vertical surfaces. Seal joints at pipes with adhesive. Remove spots or smears of adhesive immediately. Make entire surfaces of finished tile floors smooth, straight, and free from bleeding adhesive, buckles, waves or projecting tile edges upon completion. Remove any surface film on back of base due to mold release agents as recommended by base manufacturer, before applying base adhesive.

1. Where metal edge strip or transition strips are required, install as detailed.
2. Bleeding of adhesive on finished floors is considered cause for rejection. Replace damaged tiles.

B. Metal Edge Strips: Secure strips with No. 10 aluminum alloy, counter sunk flathead machine screws with expansion sleeves. Provide metal edge strips, in one piece, at any exposed edges of tile.

C. Transition Strips: Apply transition strips with adhesive continuous, between ceramic tile finish floors and resilient tile finish floors as shown.

D. Premolded Base: Install as specified in Section 09 65 13, RESILIENT BASE AND ACCESSORIES.

3.5 CLEANING

A. Upon completion of the installation, and after adhesive has cured, clean flooring in accordance with manufacturer's recommendations.

3.6 PROTECTION

A. From the time of laying until acceptance, protect the flooring from damage. Replace damaged, loose, broken, or curled tiles.

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SECTION 09 68 00
CARPETING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section specifies carpet tile, edge strips, adhesives, and other items required for complete installation.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS for additional LEED requirements.

B. Section 01 81 19, INDOOR AIR QUALITY REQUIREMENTS for VOC limit.

C. Color and texture of carpet tile and edge strip: Section 09 06 00, SCHEDULE FOR FINISHES.

D. Resilient wall base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.

1.3 QUALITY ASSURANCE

A. Carpet tile installed by mechanics certified by the Floor Covering Installation Board.

B. Certify and label the carpet tile that it has been tested and meets criteria of CRI IAQ Carpet Testing Program for indoor air quality.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data:

1. Manufacturer’s catalog data and printed documentation stating physical characteristics, durability, resistance to fading and flame resistance characteristics for each type of carpet tile material and installation accessory.
2. Manufacturer’s printed installation instructions for the carpet tile, including preparation of installation substrate, seaming techniques and recommended adhesives and tapes.
3. Manufacturer’s certificate verifying carpet tile containing recycled materials include percentage of recycled materials as specified.

C. Samples:

1. Carpet tile: "Production Quality" samples 300 x 300 mm (12 x 12 inches) of carpet tile, showing quality, pattern and color specified in Section 09 06 00, SCHEDULE FOR FINISHES.
2. Floor Edge Strip (Molding): 150 mm (6 inches) long of each color and type specified.
3. Base Edge Strip (Molding): 150 mm (6 inches) long of each color specified.

D. Shop Drawings: Installers layout plan showing seams and cuts for carpet tile.

E. Maintenance Data: Carpet tile manufacturer's maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods and cleaning cycles.

F. LEED Submittals:

1. Credits MR 4.1 & 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.
   a. Include statement indicating costs for each product containing recycled content.
2. Credit EQ 4.1: Manufacturer's product data for installation adhesives and sealants applied on site and within the vapor barrier, including printed statement of VOC content (in g/L).
3. Credit EQ 4.3:
   a. Manufacturer's product data for carpet tile, including statement of compliance with CRI Green Label Plus testing and requirements.
   b. Manufacturer's product data for carpet cushion including statement of compliance with CRI Green Label testing and requirements.
   c. Manufacturer's product data for installation adhesive, including printed statement of VOC content (in g/L).

1.5 DELIVERY AND STORAGE

A. Deliver carpet tile in manufacturer's original wrappings and packages clearly labeled with manufacturer's name, brand, name, size, dye lot number and related information.

B. Deliver adhesives in containers clearly labeled with manufacturer's name, brand name, number, installation instructions, safety instructions and flash points.

C. Store in a clean, dry, well ventilated area, protected from damage and soiling. Maintain storage space at a temperature above 16 degrees C (60 degrees F) for 2 days prior to installation.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Areas in which carpet tile is to be installed shall be maintained at a temperature above 16 degrees C (60 degrees F) for 2 days before installation, during installation and for 2 days after installation. A minimum temperature of 13 degrees C (55 degrees F) shall be maintained thereafter for the duration of the contract. Traffic or movement of furniture or equipment in carpet tile area shall not be permitted for 24 hours after installation. Other work which would damage the carpet tile shall be completed prior to installation of carpet tile.

1.7 WARRANTY

A. Carpet tile and installation subject to terms of "Warranty of Construction" FAR clause 52.246-21, except that warranty period is extended to two years.

1.8 APPLICABLE PUBLICATIONS

A. Publication listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.

B. American National Standards Institute (ANSI):
ANSI/NSF 140-07.....Sustainable Carpet Assessment Standard

C. American Association of Textile Chemists and Colorists (AATCC):
AATCC 16-04.....Colorfastness to Light
AATCC 129-05.....Colorfastness to Ozone in the Atmosphere under High Humidities
AATCC 134-06.....Electric Static Propensity of Carpets
AATCC 165-99.....Colorfastness to Crocking: Textile Floor Conerings-AATCC Crockmeter Method

D. American Society for Testing and Materials (ASTM):
ASTM D1335-05.....Tuft Bind of Pile Yarn Floor Coverings
ASTM D3278-96 (R2004)...Flash Point of Liquids by Small Scale Closed-Cup Apparatus
ASTM D5116-06.....Determinations of Organic Emissions from Indoor Materials/Products
ASTM D5252-05.....Operation of the Hexapod Tumble Drum Tester
ASTM D5417-05.....Operation of the Vettermann Drum Tester
ASTM E648-06.....Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

E. The Carpet and Rug Institute (CRI):
CRI 104-02.....Installation of Commercial Carpet

PART 2 - PRODUCTS

2.1 CARPET TILE

A. LEED Requirements:

1. Recycled Content of Steel Products: Provide steel products with minimum 25% post-consumer recycled content.
2. Provide installation adhesives, sealants, paints, and coatings applied on site and within the vapor barrier, that comply with VOC limits outlined in Division 01 Section "Indoor Air Quality Requirements."
3. Provide carpet that complies with CRI Green Label Plus testing and requirements.

Provide carpet cushion that complies CRI Green Label testing and requirements.

B. Physical Characteristics:
   1. Carpet tile free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains and other physical and manufacturing defects.
   2. Provide static control to permanently control static build upto less than 2.0 kV when tested at 20 percent relative humidity and 21 degrees C (70 degrees F) in accordance with AATCC 134.
   3. Backing materials: Manufacturer's unitary backing designed for glue-down installation using recovered materials.
   4. Appearance Retention Rating (ARR): Carpet tile shall be tested and have the minimum 3.5-4.0 Severe ARR when tested in accordance with either the ASTM D 5252 (Hexapod) or ASTM D 5417 (Vettermann) test methods using the number of cycles for short and long term tests as specified.
   5. Tuft Bind: Minimum force of 40 N (10 lb) required to pull a tuft or loop free from carpet tile backing. Test per ASTM D1335.
   6. Colorfastness to Crocking: Dry and wet crocking and water bleed, comply with AATCC 165 Color Transference Chart for colors, minimum class 4 rating.
   7. Colorfastness to Ozone: Comply with AATCC 129, minimum rating of 4 on the AATCC color transfer chart.
   8. Delamination Strength: Minimum of 440 N/m (2.5 lb/inch) between secondary backing.
   9. Flammability and Critical Radiant Flux Requirements:
      a. Test Carpet tile in accordance with ASTM E 648.
      b. Class I: Not less than 0.45 watts per square centimeter.
      c. Class II: Not less than 0.22 watts per square centimeter.
   10. Density: Average Pile Yarn Density (APYD):
      a. Corridors, lobbies, entrances, common areas or multipurpose rooms, open offices, waiting areas and dining areas: Minimum APYD 6000.
      b. Other areas: Minimum APYD 4000.
   11. VOC Limits: Use carpet tile and carpet adhesive that comply with the following limits for VOC content when tested according to ASTM D 5116:
      a. Carpet tile, Total VOCs: 0.5 mg/sq.m x hr.
      b. Carpet tile, 4-PC (4-Phenylcyclohexene): 0.05 mg/sq.m x hr.
      c. Carpet tile, Formaldehyde: 0.05 mg/sq.m x hr.
      d. Carpet tile, Styrene: 0.4 mg/sq.m x hr.

e. Adhesive, Total VOCs: 10.00 mg/sq.m x hr.

f. Adhesive, Formaldehyde: 0.05 mg/sq.m x hr.

g. Adhesive, 2-Ethyl-1-Hexanol: 3.00 mg/sq.m x hr.

C. Shall meet platinum level of ANSI/NSF 140.

D. Color, Texture, and Pattern: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.

2.2 CARPET TILE (CPT-1 & 2)

A. Basis-of-Design Product: Subject to compliance with requirements, provide Constantine Commercial; Archetype or approved equivalent.

B. Color: Refer to Section 090600, SCHEDULE OF FINISHES.

C. Pattern Repeat: None by 40-1/2 inches long.

D. Fiber Content: 100 percent nylon 6, 6.

E. Fiber Type: Ultron.

F. Pile Characteristic: Loop pile.

G. Yarn Twist: 5.0 per inch.

H. Pile Thickness: 0.15 inches for finished carpet tile.

I. Tufts: 192 per square inch.

J. Total Weight: 31 oz./sq. yd. for finished carpet tile.

K. Primary Backing/Backcoating: Manufacturer's standard multi-layered woven and non-woven composite.

L. Secondary Backing: Manufacturer's standard 100% closed cell vinyl composite backing with fiberglass inter-liner, 33% post-industrial recycled content.

M. Size: 24 by 24 inches (610 by 610 mm).

N. Applied Soil-Resistance Treatment: Manufacturer's standard material.

O. Antimicrobial Treatment: Manufacturer's standard material.

2.3 ENTRY MAT (EM-1)

A. Basis-of-Design Product: Subject to compliance with requirements, provide Interface Flor; SuperFlor or approved equivalent.

B. Color: Refer to Section 09 60 00, SCHEDULE OF FINISHES.

C. Fiber Content: 82.5 percent nylon; 17.5 percent polyester.

D. Fiber Type: Dorix.

E. Pile Characteristic: Needle punch modular carpet.

F. Density: 10.5 kilotex per cm^2.

G. Pile Thickness: 4.0 (mm).

H. Gage: 1/10 inch.

I. Total Thickness: 8.2 mm.

J. Total Weight: 24 oz./sq. yd.

K. Primary Backing/Backcoating: Manufacturer's standard composite materials.

L. Secondary Backing: Manufacturer's standard material.

M. Backing System:

N. Size: (500 by 500 mm).

O. Applied Soil-Resistance Treatment: Manufacturer's standard material.

P. Antimicrobial Treatment: Manufacturer's standard material.

2.4 ADHESIVE AND CONCRETE PRIMER

A. Waterproof, resistant to cleaning solutions, steam and water, nonflammable, complies with air-quality standards as specified. Adhesives flashpoint minimum 60 degrees C (140 degrees F), complies with ASTM D 3278.

B. Seam Adhesives: Waterproof, non-flammable and non-staining.

2.5 SEAMING TAPE

A. Permanently resistant to carpet tile cleaning solutions, steam, and water.

B. Recommended by carpet tile manufacturer.

2.6 EDGE STRIPS (MOLDING)

A. Metal:

1. Hammered surface aluminum, pinless, clamp down type designed for the carpet tile being installed.
2. Floor flange not less than 38 mm (1-/2 inches) wide, face not less than 16 mm (5/8 inch) wide.
3. Finish: Clear anodic coating unless specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.

B. Vinyl Edge Strip:

1. Beveled floor flange minimum 50 mm (2 inches) wide.
2. Beveled surface to finish flush with carpet tile for tight joint and other side to floor finish.
3. Color as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

C. Carpet tile Base Top Edge Strip:

1. Vinyl "J" strip wall flange minimum of 38 mm (1-1/2 inches) wide with cap beveled from wall to finish flush with carpet tile being installed.
2. Color as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

2.7 LEVELING COMPOUND (FOR CONCRETE FLOORS)

A. Provide Portland cement bases polymer modifier with latex or polyvinyl acetate resin manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.

B. Determine the type of underlayment selected for use by condition to be corrected.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Examine surfaces on which carpet tile is to be installed.

B. Clean floor of oil, waxy films, paint, dust and deleterious substances that prevent adhesion, leave floor dry and cured, free of residue from curing or cleaning agents.

C. Correct conditions which will impair proper installation, including trowel marks, pits, dents, protrusions, cracks or joints.

D. Fill cracks, joints depressions, and other irregularities in concrete with leveling compound.
   1. Do not use adhesive for filling or leveling purposes.
   2. Do not use leveling compound to correct imperfections which can be corrected by spot grinding.
   3. Trowel to smooth surface free of trowel marks, pits, dents, protrusions, cracks or joint lines.

E. Test new concrete subfloor prior to adhesive application for moisture and surface alkalinity per CRI 104 Section 6.3.1 or per ASTM E1907.

3.2 CARPET TILE INSTALLATION

A. Do not install carpet tile until work of other trades including painting is complete and dry.

B. Install in accordance with CRI 104 direct glue down installation.
   1. Comply with indoor air quality recommendations noted in Section 6.5.
   2. Maintain temperature in accordance with Section 15.3.

C. Secure carpet tile to subfloor of spaces with adhesive applied as recommended by carpet tile manufacturer.

D. Follow carpet tile manufacturer's recommendations for matching pattern and texture directions.

E. Cut openings in carpet tile where required for installing equipment, pipes, outlets, and penetrations.
   1. Bind or seal cut edge of carpet tile and replace flanges or plates.
   2. Use additional adhesive to secure carpet tiles around pipes and other vertical projections.

F. Carpet Tile Modules:
   1. Install per CRI 104, Section 13, Adhesive Application.
   2. Lay carpet tile modules with pile in same direction unless specified other wise in Section 09 06 00, SCHEDULE FOR FINISHES.
   3. Install carpet tile modules so that cleaning methods and solutions do not cause dislocation of modules.
   4. Lay carpet tile modules uniformly to provide tight flush joints free from movement when subject to traffic.

3.3 EDGE STRIPS INSTALLATION

A. Install edge strips over exposed carpet tile edges adjacent to uncarpeted finish flooring.

B. Anchor metal strips to floor with suitable fasteners. Apply adhesive to edge strips, insert carpet tile into lip and press it down over carpet tile.

C. Anchor vinyl edge strip to floor with adhesive apply adhesive to edge strip and insert carpet tile into lip and press lip down over carpet tile.

3.4 PROTECTION AND CLEANING

A. Remove waste, fasteners and other cuttings from carpet tile floors.

B. Vacuum carpet tile and provide suitable protection. Do not use polyethylene film.

C. Do not permit traffic on carpeted surfaces for at least 48 hours after installation. Protect the carpet tile in accordance with CRI 104.

D. Do not move furniture or equipment on unprotected carpeted surfaces.

E. Just before final acceptance of work, remove protection and vacuum carpet tile clean.

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SECTION 09 69 00
ACCESS FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Access flooring shall consist of a series of modular, removable, interchangeable panels on an elevated support system forming an accessible underfloor cavity to accommodate electrical and mechanical services. System shall be cast panels on adjustable height pedestal assemblies.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS for additional LEED requirements.
B. Section 01 81 19, INDOOR AIR QUALITY REQUIREMENTS for VOC limit.
C. Floor Finishes: Refer to Section 09 06 00, SCHEDULE FOR FINISHES.
D. Underfloor Fire Suppression System: Refer to Mechanical Contract documents.
E. Connection of access flooring systems to building ground: Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS / Section 27 05 26, GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS / Section 28 05 26, GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY.
F. Electrical distribution components: Refer to Electrical Contract documents.

1.3 DESIGN CRITERIA

A. Structural Performance per CISCA A/F: Provide access flooring systems capable of withstanding the following loads and stresses within limits and under conditions indicated, as determined by testing manufacturer's current standard products according to referenced procedures in CISCA A/F, "Recommended Test Procedures for Access Floors":
   1. Ultimate-Load Performance: Provide access flooring systems capable of withstanding a minimum ultimate concentrated load equal to value obtained by multiplying specified concentrated floor panel design load by a factor of 2.5, without failing, according to CISCA A/F, Section II, "Ultimate Loading." Failure is defined as the point at which access flooring system will not take any additional load
   2. Rolling-Load Performance: Provide access flooring systems capable of withstanding rolling loads of the following magnitude applied to non-perforated panels, with a combination of local and overall deformation not to exceed 1.02 mm (0.040 inch) after exposure to rolling load over CISCA A/F Path A or B, whichever path produces the

greatest top-surface deformation, according to CISCA A/F, Section III, "Rolling Loads."

a. CISCA A/F Wheel 1 Rolling Load: 3559 N (800 lbf).

b. CISCA A/F Wheel 2 Rolling Load: 2669 N (600 lbf).

B. Pedestal Assembly:

1. Pedestal Axial-Load Performance: Provide pedestal assemblies, without panels or other supports in place, capable of withstanding a 22. kN (5000 lbf) axial load per pedestal, according to CISCA A/F, Section V, "Pedestal Axial Load Test."
2. Pedestal Overturning-Moment Performance: Provide pedestal assemblies, without panels or other supports in place, capable of withstanding an overturning moment per pedestal of 113 N x meters (1000 lbf x inches), according to CISCA A/F, Section VI, "Pedestal Overturning Moment Test."
3. Provide a means of leveling and locking the assembly at a selected height which requires deliberate action to change height setting and which prevents vibrating displacement.
4. Height between the finish floor and underside of panel:
   a. Not less than size indicated on Drawings.

C. Panels:

1. All panels shall be interchangeable except those altered to meet special conditions.
2. Concentrated-Load Performance: Provide floor panels, including those with cutouts, capable of withstanding a concentrated design load of the following magnitude, with a top-surface deflection under load and a permanent set not to exceed, respectively, 2.03 and 0.25 mm (0.080 inch and 0.010 inch), according to CISCA A/F, Section I, Concentrated Loads."
   a. 4448 N (1000 lbf).
3. Floor Panel Impact-Load Performance: Provide access flooring system capable of withstanding an impact load of 445 N (100 lbf) when dropped from 914 mm (36 inches) onto a 6.5-sq. cm (1-sq. in.) area located anywhere on panel, without failing. Failure is defined as collapse of access flooring system.

D. Installed access floor shall be level within plus or minus 1 in 2000 (0.060 inches in 10 feet), and plus or minus 2.5 mm (0.10 inches) over the entire area. Floor assembly to be rigid, free of vibration, rocking panels, rattles and squeaks.

E. Leakage: Air leakage through the joints between panels and around the perimeter of the floor system not to exceed .057m^3 (two cubic feet) of

air per minute per linear 300 mm (foot) of joint subjected to 125 Pa (0.5 inch, water gage) positive pressure in the plenum.

F. Grounding: Components shall be in direct positive contact for safe continuous electrical grounding of the entire floor system.
   1. Panel to Understructure Resistance: Not more than 10 ohms.

G. Earthquake Load Performance: Provide access flooring capable of withstanding a lateral seismic force (Fp) in seismic zone applicable to this Project, according to requirements of ICC 2006.

H. Flame Spread Rating: Provide assembly flame spread of 25 or less using ASTM E-84 test method.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Samples: Full sized floor panel and each understructure component.

C. Shop Drawings:
   1. Floor panel layout, including railing, step and ramp location.
   2. Detail components of assembly, anchoring methods and edge details, including cut-out details, method of grounding.

D. Manufacturers' Literature and Data: Access floor.

E. Manufacturers' Certificates: Flame spread rating.

F. Floor System Test Reports: Submit certified test reports, from a testing laboratory satisfactory to the Government, attesting that the floor system proposed for installation meets all specified requirements. Submit test reports with shop drawings.

G. LEED Submittals:
   1. Credits MR 4.1 & 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.
      a. Include statement indicating costs for each product containing recycled content.
   2. Credits MR 5.1 & 5.2: For products manufactured within 500 miles of project site *and* whose raw materials are extracted, harvested or recovered, within 500 miles of the project site, documentation indicating the location and distance of material manufacturer and point of extraction, harvest, or recovery for each raw material from the Project site.
      a. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
   3. Credit EQ 4.1: Manufacturer’s product data for installation adhesives and sealants applied on site and within the vapor barrier, including printed statement of VOC content (in g/L).

4. Credit EQ 4.3:
   a. Manufacturer's product data for carpet tile, including statement of compliance with CRI Green Label Plus testing and requirements.
   b. Manufacturer's product data for carpet cushion including statement of compliance with CRI Green Label testing and requirements.
   c. Manufacturer's product data for installation adhesive, including printed statement of VOC content (in g/L).

1.5 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American Association of Textile Chemists and Colorists (AATCC):
134-01.....Electrostatic Propensity of Carpets

C. American Society for Testing and Materials (ASTM):
E84-07.....Surface Burning Characteristics of Building Materials

D. National Electrical Manufacturers Association (NEMA):
LD-3.1-05.....Application, Fabrication, and Installation of High-Pressure Decorative Laminates

E. Ceilings and Interior Systems Construction Association (CISCA):
CISCA 2004.....Recommended Test Procedures for Access Floors

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Basis-Of-Design Product: Subject to compliance with requirements, provide Tate Access Floors, Inc.; CC-1000 LOW-LOCK/POSILOCK UNDERSTRUCTURE or a comparable product by one of the following:
   1. ASM Modular Floors Inc.
   2. Computer Environments Inc.
   3. Steel InterfaceAR.
   4. Maxcess Technologies, Inc.

B. LEED Requirements:
   1. Recycled Content of Steel Products: Provide steel products with minimum 25% post-consumer recycled content.
   2. Provide installation adhesives, sealants, paints, and coatings applied on site and within the vapor barrier, that comply with VOC limits outlined in Division 01 Section "Indoor Air Quality Requirements."
   3. Provide carpet that complies with CRI Green Label Plus testing and requirements.
      Provide carpet cushion that complies CRI Green Label testing and requirements.

2.2 FLOOR COVERING

A. Refer to Section 09 06 00, SCHEDULE FOR FINISHES, for floor finish locations and product selections.

2.3 FLOOR PANELS

A. Construct panels to be uniform in face dimensions, within a tolerance of plus or minus 0.38 mm (0.015 inches) of required size and be square within a tolerance of plus or minus 0.38 mm (0.015 inches), and flatness within a tolerance of plus or minus 0.5 mm (0.02 inches). Design individual floor panels to be easily placed and removed, without disturbing adjacent panels or understructure, by one person using a tool furnished by the access floor manufacturer. Panels shall be 600 mm by 600 mm (24 inches by 24 inches) in size.

B. Concrete Panels: Panels shall be a minimum of 25 mm (1 inch) thick, molded from lightweight reinforced high strength concrete. Panel shall be a one-piece unit with a flat solid surface on top. Panel corners shall be radiused and perimeter shall be formed to receive pedestal locking mechanism.

2.4 CUT-OUTS

A. Fabricate cut-outs in floor panels to accommodate cable penetrations and service outlets where shown or specified. Provide reinforcement or additional support to make panels with cut-outs perform the same as solid uncut panels. Fit cut-outs with manufacturer's standard grommet. For cut-outs larger than maximum size grommet, trim edge of cut-outs with plastic trim, molding and/or gaskets having tapered top flange. Provide removable twist close covers for grommets.

1. Provide foam-rubber pads for sealing annular space formed in cutouts by cables and trim edge of cutout with molding having flange and ledge for capturing and supporting pads.

2.5 ACCESSORIES

A. Cavity Dividers: Provide manufacturer's standard metal dividers located where indicated to divide under floor cavities.

B. Vertical Closures (Fascia): Where under floor cavity is not enclosed by abutting walls or other construction, provide manufacturer's standard metal closure plates with factory applied finish.

C. Panel Lifting Device: Manufacturer's standard portable lifting device of type required for lifting panels with floor covering provided. Provide four lifting devices of each type required.

D. Perimeter Support: Where indicated, provide manufacturer's standard method for supporting panel edge and form transition between access flooring and adjoining floor covering at same level as access flooring.

E. Floor Cleaner: Type recommended by the floor covering manufacturer.

2.6 PEDESTALS

A. Provide manufacturer's standard pedestal assembly including base, column with provisions for adjustment, locking device, head and pad.
   1. Base: Provide pedestal base with not less than 100 mm by 100 mm (4 inches by 4 inches) of bearing area.
   2. Column: Hollow shaft of appropriate length fitted with threaded rod and leveling nut.
   3. Provide vibration proof mechanism for making and holding fine adjustments in heights for leveling purposes over a range of not less than 50 mm (2 inches). Include means of locking mechanism at a selected height.
   4. Heads: Heads shall be of a type designed to hold panels in place in a freestanding stringer less understructure.
   5. Pads: Provide sound dampening pad for each pedestal head.
   6. Fabricate units of sufficient height to provide required under floor clearance shown on drawings.

2.7 PEDESTAL BASE ADHESIVE

A. Type recommended by manufacturer.

2.8 RAMPS AND STEPS

A. Bolt ramps and steps to framing. Form step nosing, threshold strip, and floor bevel strip from extruded or cast aluminum, with non-slip traffic surface. Close exposed sides of ramp and step with not thinner than 18 gage aluminum, reinforced on the back to prevent warp. Install ramp shoes to meet main and raised access floor.

B. Ramps: Manufacturer's standard ramp construction of width and slope indicated, but not steeper than 1:12, with raised-disc rubber or vinyl floor covering, and of same materials, performance, and construction requirements as access flooring.

C. Steps: Provide steps of size and arrangement indicated with floor covering to match access flooring. Apply non-slip aluminum nosing to treads, unless otherwise indicated.

2.9 RAILING AND POSTS

A. Construct rails and posts from 32 mm (1-1/4 inch) round extruded aluminum tube shapes. Weld all joints and finish to texture of tubing. Flanges may be welded, or bolted to rails and supports.

B. Railings: Standard extruded aluminum railings, at ramps and open sided perimeter of access flooring where indicated. Include handrail, intermediate rails, posts, brackets, end caps, wall returns, wall and floor flanges, plates, and anchorage where required. Provide railings

that comply with structural performance requirements mandated by Local Code.

2.10 FINISHES

A. General: Apply finishes in factory after products are fabricated. Protect finishes on exposed surfaces with protective covering before shipment.

B. Pre-cast Concrete Panels:

1. Exposed face shall be ground smooth and polished.

2.11 FLOOR FINISH

A. Surface panels with specified material in place with a waterproof adhesive to prevent delamination by moving caster loads. Color and material as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

B. Surface ramps with material as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

C. Bolt heads or similar attachments shall not pierce the traffic surface.

PART 3 - EXECUTION

3.1 PREPARATION

A. Concrete sealers if used shall be identified and proven to be compatible with pedestal adhesive.

B. Prior to installation, subfloor shall be dry and free of any surface irregularities that could reasonably be anticipated to adversely affect access flooring system appearance or performance.

C. Clear the area in which the floor system is to be installed of debris. Clean floor surfaces and remove dust before the work is started.

3.2 INSTALLATION

A. Layout floor panel installation to keep the number of cut panels at the floor perimeter to a minimum. Scribe panel assemblies at perimeter and around column to provide a close fit with no voids greater than 6 mm (1/4 inch) where panels abut vertical surface.

B. Secure bases of pedestals to the structural subbase with an adhesive or mechanical fasteners in full and firm contact with the subbase. Set pedestals plumb, and in true alignment.

C. Provide auxiliary framing around columns and other permanent construction, at sides of ramps, at free ends of floor, and beneath floor panels that are substantially cut to accommodate utility systems.

D. Construct floor panels to lie flat without warp or twist and bear uniformly on supports without rocking, and without edges projecting above the floor plane. Panels to interlock with supports in a manner that will preclude lateral movement.

E. Provide free ends of floor with positive anchorage and rigid support where floor system does not abut wall or other construction.

F. Cover exposed ends of floor system with aluminum closures. Closures to consist of complete trim and fascia assemblies.

3.3 REPAIR OR WELDED GALVANIZED SURFACES

A. Use galvanized repair compound where galvanized surfaces are scheduled to receive field or shop coatings, and apply in accordance with manufacturers printed instructions.

3.4 CLEANING

A. Remove debris accumulated during installation from beneath the raised floor system. Immediately after completion of the floor installation, apply floor cleaner in accordance with the floor covering manufacturer's instruction. Do not allow any cleaner to remain between individual panels.

3.5 PROTECTION

A. Cover cleaned floors with clean building paper before construction traffic is permitted. Remove protective covering at completion of Work.

3.6 LIFTING DEVICES

A. Provide four floor panel lifting device for each individual floor area.

3.7 EXTRA STOCK

A. Furnish six floor panels and six complete pedestal assemblies and store where directed by the Resident Engineer.

- - - E N D - - -

SECTION 09 91 00
PAINTING

PART 1-GENERAL

1.1 DESCRIPTION

A. Section specifies field painting.

B. Section specifies prime coats which may be applied in shop under other sections.

C. Painting includes shellacs, stains, varnishes, coatings specified, and striping or markers and identity markings.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS for additional LEED requirements.

B. Section 01 81 19, INDOOR AIR QUALITY REQUIREMENTS for VOC limit.

C. Shop prime painting of steel and ferrous metals:

1. Division 05 – METALS.
2. Division 08 – OPENINGS.
3. Division 10 – SPECIALTIES.
4. Division 11 – EQUIPMENT.
5. Division 12 – FURNISHINGS.
6. Division 13 – SPECIAL CONSTRUCTION.
7. Division 14 – CONVEYING EQUIPMENT.
8. Division 21 – FIRE SUPPRESSION.
9. Division 22 – PLUMBING.
10. Division 23 – HEATING, VENTILATION AND AIR-CONDITIONING.
11. Division 26 – ELECTRICAL
12. Division 27 – COMMUNICATIONS.
13. Division 28 – ELECTRONIC SAFETY AND SECURITY.

D. Type of Finish, Color, and Gloss Level of Finish Coat: Section 09 06 00, SCHEDULE FOR FINISHES.

E. Asphalt and concrete pavement marking: Section 32 17 23, PAVEMENT MARKINGS.

1.3 PERFORMANCE REQUIREMENTS

A. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

B. Paint exposed surfaces whether or not colors are designated in "schedules," except where natural finish of material is specifically noted as a surface not to be painted. Where items or surfaces are not

specifically mentioned, paint same as adjacent similar materials or areas. If color or finish is not designated, Architect will select these from standard colors available for materials systems specified.

C. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, miscellaneous metal, hollow metal work, and similar items. Also, for shop-fabricated or factory-built mechanical and electrical equipment.

D. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory finishing or installer finishing is specified for metal toilet enclosures, acoustic materials, finished mechanical and electrical equipment including light fixtures, and switchgear.

E. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, pipe spaces, duct and plumbing shafts.

F. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting, unless otherwise indicated.

G. Operating Parts and Labels: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts will not require finish painting, unless otherwise indicated.

H. Do not paint over any code-required labels such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

1.4 REGULATORY REQUIREMENTS/QUALITY ASSURANCE

A. Paint materials shall conform to the restrictions of the local Environmental and Toxic Control jurisdiction.

1. Volatile Organic Compounds (VOC):

a. VOC content of paint materials shall not exceed 10g/l for interior latex paints/primers and 50g/l for exterior latex paints and primers.

b. Intent: Reduce the quantity of indoor air contaminants that are odorous or potentially irritating to provide installer and occupant health and comfort.

c. Requirement: Meet or exceed VOC limits to comply with United States EPA laws concerning limits on volatile organic compounds (VOC) for the Architectural and Industrial Maintenance (AIM) industry.

d. Submit Material Safety Data Sheets (MSDS's) for paints, coatings, sealers and other products which are odorous or potentially irritating.

e. New VOC Laws In Effect January 1, 2005: By law, painting contractors must use only Ozone Transport Commission (OTC) compliant coatings in their fieldwork in regulated areas beginning January 1, 2005. All coatings sold or used within the regulated areas (including Pennsylvania) must comply with the new VOC limits.

f. LEED Requirements: Interior paint shall comply with VOC limits specified in Regulation 8, Rule 51 of the Bay Area Air Quality Management District (415-771-6000) (www.baaqmd.gov).

2. Lead-Base Paint:

a. Comply with Section 410 of the Lead-Based Paint Poisoning Prevention Act, as amended, and with implementing regulations promulgated by Secretary of Housing and Urban Development.

b. Regulations concerning prohibition against use of lead-based paint in federal and federally assisted construction, or rehabilitation of residential structures are set forth in Subpart F, Title 24, Code of Federal Regulations, Department of Housing and Urban Development.

c. For lead-paint removal, see Section 02 83 33.13, LEAD-BASED PAINT REMOVAL AND DISPOSAL.

3. Asbestos: Materials shall not contain asbestos.

4. Chromate, Cadmium, Mercury, and Silica: Materials shall not contain zinc-chromate, strontium-chromate, Cadmium, mercury or mercury compounds or free crystalline silica.

5. Human Carcinogens: Materials shall not contain any of the ACGIH-BKLT and ACGHI-DOC confirmed or suspected human carcinogens.

6. Use high performance acrylic paints in place of alkyd paints, where possible.

7. VOC content for solvent-based paints shall not exceed 250g/l and shall not be formulated with more than one percent aromatic hydro carbons by weight.

1.5 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.

2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.

3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
5. Gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.6 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. LEED Submittals:
1. Credit EQ 4.2: Manufacturer’s product data for installation paints and coatings applied on-site and within the vapor barrier, including printed statement of VOC content (in g/L).

C. Manufacturer's Literature and Data:
1. Before work is started, or sample panels are prepared, submit manufacturer's literature, indicating brand label, product name and product code as of the date of contract award, will be used to determine compliance with the submittal requirements of this specification. Only one list may be used for the entire contract and each coating system is to be from a single manufacturer. All coats on a particular substrate must be from a single manufacturer.

D. Sample Panels:
1. After painters' materials have been approved and before work is started submit sample panels showing each type of finish and color specified.
2. Panels to show color: Composition board, 100 by 250 by 3 mm (4 inch by 10 inch by 1/8 inch).
3. Panel to show transparent finishes: Wood of same species and grain pattern as wood approved for use, 100 by 250 by 3 mm (4 inch by 10 inch face by 1/4 inch) thick minimum, and where both flat and edge grain will be exposed, 250 mm (10 inches) long by sufficient size, 50 by 50 mm (2 by 2 inch) minimum or actual wood member to show complete finish.
4. Attach labels to panel stating the following:
   a. Manufacturers name and product number of paints used.
   b. Specification code number specified in Section 09 06 00, SCHEDULE FOR FINISHES.
   c. Product type and color.
   d. Name of project.

5. Strips showing not less than 50 mm (2 inch) wide strips of undercoats and 100 mm (4 inch) wide strip of finish coat.

E. Sample of identity markers if used.

F. Manufacturers' Certificates indicating compliance with specified requirements.

G. LEED submittals

1. Credit EQ 4.2: Manufacturer’s product data for installation paints and coatings applied on-site and within the vapor barrier, including printed statement of VOC content (in g/L).

a. Provide VOC data and gallons furnished for each coating.

1.7 DELIVERY AND STORAGE

A. Deliver materials to site in manufacturer's sealed container marked to show following:

1. Name of manufacturer.
2. Product type.
3. Batch number.
4. Instructions for use.
5. Safety precautions.

B. In addition to manufacturer's label, provide a label legibly printed as following:

1. Federal Specification Number, where applicable, and name of material.
2. Surface upon which material is to be applied.
3. If paint or other coating, state coat types; prime, body or finish.

C. Maintain space for storage, and handling of painting materials and equipment in a neat and orderly condition to prevent spontaneous combustion from occurring or igniting adjacent items.

D. Store materials at site at least 24 hours before using, at a temperature between 18 and 30 degrees C (65 and 85 degrees F).

1.8 MOCK-UP PANEL

A. Before starting application of water paint mixtures, apply paint as specified to an area, not to exceed 9 m^2 (100 ft^2), selected by Resident Engineer.

B. Finish and texture approved by Resident Engineer and Architect will be used as a standard of quality for remainder of work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide PPG Industries, Pittsburgh Paints or comparable products from one of the following:
   1. Sherwin-Williams Co.
   2. Benjamin Moore and Co.
   3. ICI Paint Stores, Inc.
   4. Duron Paints and Wallcoverings.

B. LEED Requirements:
   1. Provide installation adhesives, sealants, paints, and coatings applied on site and within the vapor barrier, that comply with VOC limits outlined in Division 01 Section "Indoor Air Quality Requirements."

2.2 COLORS AND FINISHES

A. Refer to Finish Schedule/ Legend. If not indicated, provide the following.
   1. Colors will be selected by the Architect after award of the Contract.
      a. Prior to beginning work, Contractor will furnish color selection schedule or chips for surfaces to be painted to the Architect for approval.
      b. No limitation on quantity of colors selected for use on project. Multiple colors will be used in rooms; no more than 1 color for any one wall, unless noted on drawings, or separated by wood trim such as chair rails.

B. Color pigments: Pure, non-fading, applicable types to suite the substrates and service indicated.

2.3 MATERIALS

A. Materials shown in "Painting Schedule" are the products of PPG Industries, unless otherwise noted.

B. General: Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable. Provide undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.

C. Previously painted surfaces shall be "scuff-sanded" and shall receive a minimum paint system of 2 finish coats. Spot prime paint repaired areas.

1. Prime paint previously painted surfaces where recommended by paint manufacturer; apply one coat of tinted primer and one finish coat instead of two finish coats.

D. Paint Coordination: Provide finish coats which are compatible with prime paints used. Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information on characteristics of finish materials proposed for use, to ensure compatible prime coats are used. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify Resident Engineer in writing of any anticipated problems using specified coating systems with substrates primed by others.

2.4 PAINT PROPERTIES

A. Use ready-mixed (including colors), except two component epoxies, polyurethanes, polyesters, paints having metallic powders packaged separately and paints requiring specified additives.

B. Where no requirements are given in the referenced specifications for primers, use primers with pigment and vehicle, compatible with substrate and finish coats specified.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

A. Safety: Observe required safety regulations and manufacturer's warning and instructions for storage, handling and application of painting materials.

1. Take necessary precautions to protect personnel and property from hazards due to falls, injuries, toxic fumes, fire, explosion, or other harm.
2. Deposit soiled cleaning rags and waste materials in metal containers approved for that purpose. Dispose of such items off the site at end of each days work.

B. Atmospheric and Surface Conditions:

1. Do not apply coating when air or substrate conditions are:
   a. Less than 3 degrees C (5 degrees F) above dew point.
   b. Below 10 degrees C (50 degrees F) or over 35 degrees C (95 degrees F), unless specifically pre-approved by the Contracting Officer and the product manufacturer. Under no circumstances shall application conditions exceed manufacturer recommendations.
2. Maintain interior temperatures until paint dries hard.
3. Do no exterior painting when it is windy and dusty.

4. Do not paint in direct sunlight or on surfaces that the sun will soon warm.
5. Apply only on clean, dry and frost free surfaces except as follows:
   a. Apply water thinned acrylic and cementitious paints to damp (not wet) surfaces where allowed by manufacturer's printed instructions.
   b. Dampened with a fine mist of water on hot dry days concrete and masonry surfaces to which water thinned acrylic and cementitious paints are applied to prevent excessive suction and to cool surface.
6. Varnishing:
   a. Apply in clean areas and in still air.
   b. Before varnishing vacuum and dust area.
   c. Immediately before varnishing wipe down surfaces with a tack rag.

3.2 SURFACE PREPARATION

A. Method of surface preparation is optional, provided results of finish painting produce solid even color and texture specified with no overlays.

B. General:
1. Remove prefinished items not to be painted such as lighting fixtures, escutcheon plates, hardware, trim, and similar items for reinstallation after paint is dried.
2. Remove items for reinstallation and complete painting of such items and adjacent areas when item or adjacent surface is not accessible or finish is different.
3. See other sections of specifications for specified surface conditions and prime coat.
4. Clean surfaces for painting with materials and methods compatible with substrate and specified finish. Remove any residue remaining from cleaning agents used. Do not use solvents, acid, or steam on concrete and masonry.

C. Wood:
1. Sand to a smooth even surface and then dust off.
2. Sand surfaces showing raised grain smooth between each coat.
3. Wipe surface with a tack rag prior to applying finish.
4. Surface painted with an opaque finish:
   a. Coat knots, sap and pitch streaks with Knot Sealer before applying paint.
   b. Apply two coats of Knot Sealer over large knots.
5. After application of prime or first coat of stain, fill cracks, nail and screw holes, depressions and similar defects with wood filler

paste. Sand the surface to make smooth and finish flush with adjacent surface.

6. Before applying finish coat, reapply wood filler paste if required, and sand surface to remove surface blemishes. Finish flush with adjacent surfaces.
7. Fill open grained wood such as oak, walnut, ash and mahogany with Wood Filler Paste, colored to match wood color.
   a. Thin filler in accordance with manufacturer's instructions for application.
   b. Remove excess filler, wipe as clean as possible, dry, and sand as specified.

D. Ferrous Metals:

1. Remove oil, grease, soil, drawing and cutting compounds, flux and other detrimental foreign matter in accordance with SSPC-SP 1 (Solvent Cleaning).
2. Remove loose mill scale, rust, and paint, by hand or power tool cleaning, as defined in SSPC-SP 2 (Hand Tool Cleaning) and SSPC-SP 3 (Power Tool Cleaning). Exception: where high temperature aluminum paint is used, prepare surface in accordance with paint manufacturer's instructions.
3. Fill dents, holes and similar voids and depressions in flat exposed surfaces of hollow steel doors and frames, access panels, roll-up steel doors and similar items specified to have semi-gloss or gloss finish with TT-F-322D (Filler, Two-Component Type, For Dents, Small Holes and Blow-Holes). Finish flush with adjacent surfaces.
   a. This includes flat head countersunk screws used for permanent anchors.
   b. Do not fill screws of item intended for removal such as glazing beads.
4. Spot prime abraded and damaged areas in shop prime coat which expose bare metal with same type of paint used for prime coat. Feather edge of spot prime to produce smooth finish coat.
5. Spot prime abraded and damaged areas which expose bare metal of factory finished items with paint as recommended by manufacturer of item.

E. Zinc-Coated (Galvanized) Metal, Aluminum, Copper and Copper Alloys Surfaces Specified Painted:

1. Clean surfaces to remove grease, oil and other deterrents to paint adhesion in accordance with SSPC-SP 1 (Solvent Cleaning).

2. Spot coat abraded and damaged areas of zinc-coating which expose base metal on hot-dip zinc-coated items with Organic Zinc Rich Coating. Prime or spot prime with Waterborne Galvanized Primer or Non-Cementitious Galvanized Primer depending on finish coat compatibility.

F. Masonry, Concrete, Cement Board, Cement Plaster and Stucco:
1. Clean and remove dust, dirt, oil, grease efflorescence, form release agents, laitance, and other deterrents to paint adhesion.
2. Use emulsion type cleaning agents to remove oil, grease, paint and similar products. Use of solvents, acid, or steam is not permitted.
3. Remove loose mortar in masonry work.
4. Replace mortar and fill open joints, holes, cracks and depressions with new mortar specified in Section 04 05 13, MASONRY MORTARING , Section 04 05 16, MASONRY GROUTING. Do not fill weep holes. Finish to match adjacent surfaces.
5. Neutralize Concrete floors to be painted by washing with a solution of 1.4 Kg (3 pounds) of zinc sulfate crystals to 3.8 L (1 gallon) of water, allow to dry three days and brush thoroughly free of crystals.
6. Repair broken and spalled concrete edges with concrete patching compound to match adjacent surfaces as specified in CONCRETE Sections. Remove projections to level of adjacent surface by grinding or similar methods.

G. Gypsum Board:
1. Remove efflorescence, loose and chalking plaster or finishing materials.
2. Remove dust, dirt, and other deterrents to paint adhesion.
3. Fill holes, cracks, and other depressions with Gypsum (Spackling Compound) finished flush with adjacent surface, with texture to match texture of adjacent surface. Patch holes over 25 mm (1-inch) in diameter as specified in Section for gypsum board.

3.3 PAINT PREPARATION

A. Thoroughly mix painting materials to ensure uniformity of color, complete dispersion of pigment and uniform composition.
B. Do not thin unless necessary for application and when finish paint is used for body and prime coats. Use materials and quantities for thinning as specified in manufacturer's printed instructions.
C. Remove paint skins, then strain paint through commercial paint strainer to remove lumps and other particles.

D. Mix two component and two part paint and those requiring additives in such a manner as to uniformly blend as specified in manufacturer's printed instructions unless specified otherwise.

E. For tinting required to produce exact shades specified, use color pigment recommended by the paint manufacturer.

3.4 APPLICATION

A. Start of surface preparation or painting will be construed as acceptance of the surface as satisfactory for the application of materials.

B. Unless otherwise specified, apply paint in three coats; prime, body, and finish. When two coats applied to prime coat are the same, first coat applied over primer is body coat and second coat is finish coat.

C. Apply each coat evenly and cover substrate completely.

D. Allow not less than 48 hours between applications of succeeding coats, except as allowed by manufacturer's printed instructions, and approved by Resident Engineer.

E. Finish surfaces to show solid even color, free from runs, lumps, brush marks, laps, holidays, or other defects.

F. Apply by brush, roller or spray, except as otherwise specified.

G. Do not spray paint in existing occupied spaces unless approved by Resident Engineer, except in spaces sealed from existing occupied spaces.

1. Apply painting materials specifically required by manufacturer to be applied by spraying.
2. In areas, where paint is applied by spray, mask or enclose with polyethylene, or similar air tight material with edges and seams continuously sealed including items specified in WORK NOT PAINTED, motors, controls, telephone, and electrical equipment, fronts of sterilizes and other recessed equipment and similar prefinished items.

H. Do not paint in closed position operable items such as access doors and panels, window sashes, overhead doors, and similar items except overhead roll-up doors and shutters.

3.5 PRIME PAINTING

A. After surface preparation prime surfaces before application of body and finish coats, except as otherwise specified.

B. Spot prime and apply body coat to damaged and abraded painted surfaces before applying succeeding coats.

C. Additional field applied prime coats over shop or factory applied prime coats are not required except for exterior exposed steel apply an additional prime coat.

3.6 EXTERIOR FINISHES

A. Apply following finish coats where specified in Section 09 06 00, SCHEDULE FOR FINISHES.

B. Exterior Ferrous Metal: 100 percent acrylic DTM (Direct-To-Metal) Industrial Enamel; 2 finish coats over primer. Satin or gloss as selected by Architect.

NOTE: Scuff-sand shop approved primer or previous painted surface.

1 coat of PPG Pitt Tech Int/Ext Primer 90-712; 100 percent acrylic.

2 coats of PPG Pitt Tech Int./Ext DTM Industrial Enamel; 90-474 Series Satin; 90-374 Series High Gloss; 100 percent acrylic.

NOTE: First coat not required if factory primed – scuff sand factory or previous primer.

NOTE: Architect’s option to use gloss or satin sheen at no additional cost.

C. Exterior Galvanized Metal: 100 percent acrylic DTM (Direct-To-Metal) Industrial Enamel; 2 finish coats over primer. Satin or gloss as selected by Architect.

NOTE: Shop Prime Painted Galvanized Metal: Scuff-sand shop approved primer or previous painted surface.

NOTE: Exposed Galvanized Metal: Thoroughly remove all foreign contamination by wiping with suitable solvent. Remove any conversion coatings.

1 coat of PPG Pitt Tech Int/Ext Primer 90-712; 100 percent acrylic.

2 coats of PPG Pitt Tech Int./Ext DTM Industrial Enamel; 90-474 Series Satin; 90-374 Series High Gloss; 100 percent acrylic.

NOTE: First coat not required if factory primed; scuff- sand factory or previous primer.

NOTE: Architect's option to use gloss or satin sheen at no additional cost.

3.7 INTERIOR FINISHES

A. Apply following finish coats over prime coats in spaces or on surfaces specified in Section 09 06 00, SCHEDULE FOR FINISHES.

B. Gypsum Board (Drywall): Eggshell acrylic latex finish; 2 finish coats over primer/sealer. Zero VOC and low odor; Green Seal Certified; anti-microbial paint.

1 coat of PPG Pure Performance Primer 9-900.

2 coats of PPG Pure Performance, eggshell 9-300 Series.

C. Gypsum Board (Epoxy Finish): Waterborne epoxy finish (semigloss); 2 finish coats over primer required. Dry areas only; moderate environments.

1 coat of PPG Speedhide Quick Drying Latex Primer 6-2.

2 coats of PPG Pitt-Glaze WB Acrylic Epoxy Series 16-551.

D. Gypsum Board (Metallic Finish): Low odor, low VOC, LEED compliant metallic paint (textured); 2 finish coats over primer required.

1 coat of SCUFFMASTER TINTED UNDERCOAT [Primer/Sealer].

2 coats of SCUFFMASTER ENVIROMETAL.

E. Interior Ferrous Metal: 100 percent acrylic DTM (Direct-To-Metal) Industrial Enamel; 2 finish coats over primer. Satin or gloss as selected by Architect.

NOTE: Scuff-sand shop approved primer or previous painted surface.

1 coat of PPG Pitt Tech Int/Ext Primer 90-712; for ferrous metal and galvanized steel.

2 coats of PPG Pitt Tech Int./Ext DTM Industrial Enamel; 90-474 Series Satin; 90-374 Series High Gloss.

NOTE: First coat not required if factory primed – scuff-sand factory or previous primer.

NOTE: Architect's option to use gloss or satin sheen at no additional cost.

F. Interior Ferrous Metal: Eggshell acrylic finish; 2 finish coats over primer. Zero VOC and low odor; Green Seal Certified; anti-microbial paint (topcoat).

1 coat of PPG Pitt-Tech Primer 90-712 (galvanized and non-galvanized metal)

2 coats of PPG Pure Performance, flat 9-100 Series.

2 coats of PPG Pure Performance, eggshell 9-300 series.

NOTE: First coat not required if factory primed. Spot prime abraded areas only with specified primer.

G. Interior Woodwork (Opaque Finish): Eggshell acrylic finish; 2 finish coats over primer.

1 coat of PPG Seal-Grip Interior Latex Enamel Undercoater 17-955.

2 coats of Eggshell Manor Hall Enamel, 89 line; 100 percent acrylic.

H. Interior Woodwork (Opaque Finish): Eggshell acrylic finish: 2 finish coats over primer. Zero VOC and low odor; Green Seal Certified; anti-microbial paint (topcoat).

1 coat of PPG Seal-Grip Interior Latex Enamel Undercoater 17-955.

2 coats of PPG Pure Performance, eggshell 9-300 Series.

I. Interior Woodwork (Transparent Finish): Satin finish; minimum 3 finish coats over stain. Provide additional coats of stain, as required, to achieve color as selected by Architect.

1 coat of Olympic Interior Low VOC Oil Stain 44500.

2 coats of Olympic Interior Water Based Polyurethane Gloss 42784.

1 coat of Olympic Interior Water Based Polyurethane Satin 42786.

J. Interior Woodwork (Transparent Finish): Acrylic polyurethane satin finish; minimum 3 finish coats over stain. Provide additional coats of stain, as required, to achieve color as selected by Architect.

1 coat of Olympic Interior Low VOC Oil Stain 44500.

2 coats of Olympic Interior Water Based Polyurethane Gloss 42784.

1 coat of Olympic Interior Water Based Polyurethane Satin 42786.

3.8 MECHANICAL AND ELECTRICAL WORK FIELD PAINTING SCHEDULE

A. Field painting of mechanical and electrical consists of cleaning, touching-up abraded shop prime coats, and applying prime, body and finish coats to materials and equipment if not factory finished in space scheduled to be finished.

B. In spaces not scheduled to be finish painted in Section 09 06 00, SCHEDULE FOR FINISHES paint as specified under paragraph H, colors.

C. Paint various systems specified in Division 02 – EXISTING CONDITIONS, Division 21 – FIRE SUPPRESSION, Division 22 - PLUMBING, Division 23 – HEATING, VENTILATION AND AIR-CONDITIONING, Division 26 - ELECTRICAL, Division 27 - COMMUNICATIONS, and Division 28 – ELECTRONIC SAFETY AND SECURITY.

D. Paint after tests have been completed.

E. Omit prime coat from factory prime-coated items.

F. Finish painting of mechanical and electrical equipment is not required when located in interstitial spaces, above suspended ceilings, in concealed areas such as pipe and electric closets, pipe basements, pipe tunnels, trenches, attics, roof spaces, shafts and furred spaces except on electrical conduit containing feeders 600 volts or more.

G. Omit field painting of items specified in paragraph, Building and Structural WORK NOT PAINTED.

H. Color:

1. Paint items having no color specified in Section 09 06 00, SCHEDULE FOR FINISHES to match surrounding surfaces.
2. Paint colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES except for following:

a. White .....Exterior unfinished surfaces of enameled plumbing fixtures. Insulation coverings on breeching and uptake inside boiler house, drums and drum-heads, oil heaters, condensate tanks and condensate piping.

b. Gray: .....Heating, ventilating, air conditioning and refrigeration equipment (except as required to match surrounding surfaces), and water and sewage treatment equipment and sewage ejection equipment.

c. Aluminum Color: Ferrous metal on outside of boilers and in connection with boiler settings including supporting doors and door frames and fuel oil burning equipment, and steam generation system (bare piping, fittings, hangers, supports, valves, traps and miscellaneous iron work in contact with pipe).

d. Federal Safety Red: Exposed fire protection piping hydrants, post indicators, electrical conducts containing fire alarm control wiring, and fire alarm equipment.

e. Federal Safety Orange: .Entire lengths of electrical conduits containing feeders 600 volts or more.

f. Color to match brickwork sheet metal covering on breeching outside of exterior wall of boiler house.

I. Apply paint systems on properly prepared and primed surfaces.

3.9 BUILDING AND STRUCTURAL WORK FIELD PAINTING

A. Painting and finishing of interior and exterior work except as specified under paragraph 3.11 B.

1. Painting and finishing of new work including colors and gloss of finish selected is specified in Finish Schedule, Section 09 06 00, SCHEDULE FOR FINISHES.
2. Painting of disturbed, damaged and repaired or patched surfaces when entire space is not scheduled for complete repainting or refinishing.
3. Painting of ferrous metal and galvanized metal.
4. Painting of wood with fire retardant paint exposed in attics, when used as mechanical equipment space.
5. Identity painting and safety painting.

B. Building and Structural Work not Painted:

1. Prefinished items:

a. Casework, doors, elevator entrances and cabs, metal panels, wall covering, and similar items specified factory finished under other sections.

b. Factory finished equipment and pre-engineered metal building components such as metal roof and wall panels.

2. Finished surfaces:
   a. Hardware except ferrous metal.
   b. Anodized aluminum, stainless steel, chromium plating, copper, and brass, except as otherwise specified.
   c. Signs, fixtures, and other similar items integrally finished.
3. Concealed surfaces:
   a. Inside dumbwaiter, elevator and duct shafts, interstitial spaces, pipe basements, crawl spaces, pipe tunnels, above ceilings, attics, except as otherwise specified.
   b. Inside walls or other spaces behind access doors or panels.
   c. Surfaces concealed behind permanently installed casework and equipment.
4. Moving and operating parts:
   a. Shafts, chains, gears, mechanical and electrical operators, linkages, and sprinkler heads, and sensing devices.
   b. Tracks for overhead or coiling doors, shutters, and grilles.
5. Labels:
   a. Code required label, such as Underwriters Laboratories Inc., Inchcape Testing Services, Inc., or Factory Mutual Research Corporation.
   b. Identification plates, instruction plates, performance rating, and nomenclature.
6. Galvanized metal:
   a. Exterior chain link fence and gates, corrugated metal areaways, and gratings.
   b. Gas Storage Racks.
   c. Except where specifically specified to be painted.
7. Metal safety treads and nosings.
8. Gaskets.
9. Concrete curbs, gutters, pavements, retaining walls, exterior exposed foundations walls and interior walls in pipe basements.
10. Face brick.
11. Structural steel encased in concrete, masonry, or other enclosure.
12. Structural steel to receive sprayed-on fire proofing.
13. Ceilings, walls, columns in interstitial spaces.
14. Ceilings, walls, and columns in pipe basements.

3.10 IDENTITY PAINTING SCHEDULE

A. Identify designated service in accordance with ANSI A13.1, unless specified otherwise, on exposed piping, piping above removable ceilings, piping in accessible pipe spaces, interstitial spaces, and piping behind access panels.

1. Legend may be identified using 2.1 G options or by stencil applications.
2. Apply legends adjacent to changes in direction, on branches, where pipes pass through walls or floors, adjacent to operating accessories such as valves, regulators, strainers and cleanouts a minimum of 12 000 mm (40 feet) apart on straight runs of piping. Identification next to plumbing fixtures is not required.
3. Locate Legends clearly visible from operating position.
4. Use arrow to indicate direction of flow.
5. Identify pipe contents with sufficient additional details such as temperature, pressure, and contents to identify possible hazard. Insert working pressure shown on drawings where asterisk appears for High, Medium, and Low Pressure designations as follows:
   a. High Pressure - 414 kPa (60 psig) and above.
   b. Medium Pressure - 104 to 413 kPa (15 to 59 psig).
   c. Low Pressure - 103 kPa (14 psig) and below.
   d. Add Fuel oil grade numbers.
6. Legend name in full or in abbreviated form as follows:

PIPING	COLOR OF EXPOSED PIPING	COLOR OF BACKGROUND	COLOR OF LETTERS	LEGEND ABBREVIATIONS
Blow-off		Yellow	Black	Blow-off
Boiler Feedwater		Yellow	Black	Blr Feed
A/C Condenser Water Supply		Green	White	A/C Cond Wtr Sup
A/C Condenser Water Return		Green	White	A/C Cond Wtr Ret
Chilled Water Supply		Green	White	Ch. Wtr Sup
Chilled Water Return		Green	White	Ch. Wtr Ret
Shop Compressed Air		Yellow	Black	Shop Air
Air-Instrument Controls		Green	White	Air-Inst Cont
Drain Line		Green	White	Drain
Emergency Shower		Green	White	Emg Shower
High Pressure Steam		Yellow	Black	H.P. _____*
High Pressure Condensate Return		Yellow	Black	H.P. Ret ____*
Medium Pressure Steam		Yellow	Black	M. P. Stm ____*

Medium Pressure Condensate Return		Yellow	Black	M.P. Ret _____*
Low Pressure Steam		Yellow	Black	L.P. Stm _____*
Low Pressure Condensate Return		Yellow	Black	L.P. Ret _____*
High Temperature Water Supply		Yellow	Black	H. Temp Wtr Sup
High Temperature Water Return		Yellow	Black	H. Temp Wtr Ret
Hot Water Heating Supply		Yellow	Black	H. W. Htg Sup
Hot Water Heating Return		Yellow	Black	H. W. Htg Ret
Gravity Condensate Return		Yellow	Black	Gravity Cond Ret
Pumped Condensate Return		Yellow	Black	Pumped Cond Ret
Vacuum Condensate Return		Yellow	Black	Vac Cond Ret
Fuel Oil - Grade		Green	White	Fuel Oil-Grade __*
Boiler Water Sampling		Yellow	Black	Sample
Chemical Feed		Yellow	Black	Chem Feed
Continuous Blow-Down		Yellow	Black	Cont. B D
Pumped Condensate		Black		Pump Cond
Pump Recirculating		Yellow	Black	Pump-Recirc.
Vent Line		Yellow	Black	Vent
Alkali		Yellow	Black	Alk
Bleach		Yellow	Black	Bleach
Detergent		Yellow	Black	Det
Liquid Supply		Yellow	Black	Liq Sup
Reuse Water		Yellow	Black	Reuse Wtr
Cold Water (Domestic)	White	Green	White	C.W. Dom
Hot Water (Domestic)				
Supply	White	Yellow	Black	H.W. Dom
Return	White	Yellow	Black	H.W. Dom Ret
Tempered Water	White	Yellow	Black	Temp. Wtr
Ice Water				
Supply	White	Green	White	Ice Wtr
Return	White	Green	White	Ice Wtr Ret
Reagent Grade Water		Green	White	RG
Reverse Osmosis		Green	White	RO
Sanitary Waste		Green	White	San Waste
Sanitary Vent		Green	White	San Vent
Storm Drainage		Green	White	St Drain
Pump Drainage		Green	White	Pump Disch
Chemical Resistant Pipe				
Waste		Yellow	Black	Acid Waste

Vent	Yellow	Black	Acid Vent
Atmospheric Vent	Green	White	ATV
Silver Recovery	Green	White	Silver Rec
Oral Evacuation	Green	White	Oral Evac
Fuel Gas	Yellow	Black	Gas
Fire Protection Water			
Sprinkler	Red	White	Auto Spr
Standpipe	Red	White	Stand
Sprinkler	Red	White	Drain
Hot Water Supply Domestic/Solar Water			H.W. Sup Dom/SW
Hot Water Return Domestic/Solar Water			H.W. Ret Dom/SW

7. Electrical Conduits containing feeders over 600 volts, paint legends using 50 mm (2 inch) high black numbers and letters, showing the voltage class rating. Provide legends where conduits pass through walls and floors and at maximum 6100 mm (20 foot) intervals in between. Use labels with yellow background with black border and words Danger High Voltage Class, 5000, 15000, 25000.
8. See Sections for methods of identification, legends, and abbreviations of the following:
   a. Regular compressed air lines: Section 22 15 00, GENERAL SERVICE COMPRESSED-AIR SYSTEMS.
   b. Dental compressed air lines: Section 22 61 13.74, DENTAL COMPRESSED-AIR PIPING / Section 22 61 19.74, DENTAL COMPRESSED-AIR EQUIPMENT.
   c. Laboratory gas and vacuum lines: Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES, Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES.
   d. Oral evacuation lines: Section 22 62 19.74, DENTAL VACUUM AND EVACUATION EQUIPMENT.
   e. Medical Gases and vacuum lines: Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES, Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES.
   f. Conduits containing high voltage feeders over 600 volts: Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS, Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS, Section 28 05 33, RACEWAYS AND BOXES FOR ELECTRONIC SAFETY AND SECURITY.

B. Fire and Smoke Partitions:
   1. Identify partitions above ceilings on both sides of partitions except within shafts in letters not less than 64 mm (2 1/2 inches) high.

2. Stenciled message: "SMOKE BARRIER" or, "FIRE BARRIER" as applicable.
3. Locate not more than 6100 mm (20 feet) on center on corridor sides of partitions, and with a least one message per room on room side of partition.
4. Use semigloss paint of color that contrasts with color of substrate.

C. Identify columns in pipe basements and interstitial space:
1. Apply stenciled number and letters to correspond with grid numbering and lettering shown.
2. Paint numbers and letters 100 mm (4 inches) high, locate 450 mm (18 inches) below overhead structural slab.
3. Apply on four sides of interior columns and on inside face only of exterior wall columns.
4. Color:
a. Use black on concrete columns.
b. Use white or contrasting color on steel columns.

3.11 PROTECTION CLEAN UP, AND TOUCH-UP

A. Protect work from paint droppings and spattering by use of masking, drop cloths, removal of items or by other approved methods.

B. Upon completion, clean paint from hardware, glass and other surfaces and items not required to be painted of paint drops or smears.

C. Before final inspection, touch-up or refinished in a manner to produce solid even color and finish texture, free from defects in work which was damaged or discolored.

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